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CONFERENCE ON MANUAL
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THE PAPERS READ AND A PHONOGRAPHIC REPORT OF THE DISCUSSIONS
HAD AT THE SESSIONS OF A CONFERENCE ON MANUAL
TRAINING, HELD AT BOSTON, APRIL 8-11, 1891.

TO WHICH IS APPENDED SOME ACCOUNT OF THE EXHIBITS MADE OF
THE METHODS AND RESULTS OF MANUAL TRAINING, INCLUD-
ING ALSO SEWING, COOKING, DRAWING, AND THE
STUDY OF FORM AND COLOR.

EDITED BY MRS. ISABEL C. BARROWS.

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PREFACE.

THE idea of a conference on manual training was suggested and encouraged by the success attending a very interesting meeting of like sort, though in relation to a different matter,—the celebrated Conference on Physical Training held in Boston in November, 1889. Moreover, the same practical wisdom which designed and managed that conference was freely consulted by the managers of the Conference on Manual Training. Hence our acknowledgments are due in the first place to Miss Amy M. Homans. Next should be recorded the fact that ample financial support to our enterprise was given by two public-spirited women of Boston, who thus have added one more to the many services they have already rendered public education,—Mrs. Mary Hemenway and Mrs. Quincy A. Shaw.

The great importance of such services to education as Mrs. Hemenway and Mrs. Shaw have rendered is measured not alone by the large expenditures of money involved, but also by taking into consideration the occasions and the results of their enterprises. If education be a science at all,—which some incline to doubt or even deny,—it is surely a science of the inductive type. Progress in it must be made by observation and experiment rather than by reasoning from abstract principles. But experiments are costly, and the results are not always pleasing; so that there exists naturally enough among public school officials a well-grounded disinclination to venture upon the uncertainties of experimental investigation with the schools and the public money intrusted to their care. Just here, however, lies the opportunity for private enterprise. What may not properly be undertaken at public expense, the issue being yet doubtful, may be permitted to be undertaken at private expense temporarily, as an experiment, for the sake of the information to be gathered from practical results. Later, when the value of a new method or of a new subject-matter of instruction has been experimentally demonstrated, public authorities may feel justified in adopting the improvement. How public instruction in Boston has been improved and extended from time to time through the efforts of wisely directed private enterprise would be a long history to write; but conspicuous chapters thereof would describe the introduction of sewing, cooking, and school gymnastics through the efforts of Mrs. Hemenway, and the ultimate adoption of the kindergartens for many years supported by Mrs. Shaw. As to manual training, it must still be said that, however sure we may feel of the main principle, the experimental working out of details has not yet advanced so far as to remove the need of private efforts and private pecuniary aid.

Much, however, has been done, and well done, in this direction. Indeed,

it was the chief purpose of the great meeting reported in the following pages to set forth, both by oral statement and by objective illustration, the methods and the practical results of manual training as thus far applied to all grades of instruction from the kindergarten to the university. This was the large outline of our undertaking. The filling in of details, though very far from being complete, was surprisingly beyond our expectations; while the number of people drawn to the exhibition either by interest or curiosity daily, and especially in the evening, was greater than the most sanguine would have dared to predict.

The record of all that was said at the sessions of the Conference is complete and exact. The papers are printed from the authors' manuscript, and the discussions from phonographic reports. But no record or verbal description could do justice to the varied and interesting exhibits which filled the rooms, the corridors, and the great drill hall of the English High School building. Some indications of their extent and variety are preserved in the appendix to this pamphlet; but any real image of them can live only in the recollections of many among the fifteen thousand people who, it is safe to say, visited the exhibition and assembly rooms during the three days and evenings of the Conference.

That the exhibition, the papers, and the discussions have greatly spread and deepened the popular interest in manual training there can be no doubt. It is with the hope of promoting this interest still further that the Executive Committee of the New England Conference of Educational Workers has undertaken the publication of this pamphlet.

EDWIN P. SEAVER.

BOSTON, July, 1891.

CONFERENCE ON MANUAL TRAINING.

First Session.

Wednesday, April 8, 1891.

A Conference on Manual Training was held by the New England Conference of Educational Workers in the English High School building in Boston, April 8-11, 1891.

The Conference opened on Wednesday, April 8, at 8 P.M., with addresses by his Excellency Governor Russell, Dr. Samuel Eliot, Charles W. Eliot, President of Harvard College, W. H. Lincoln, W. B. Powell, Superintendent of schools in Washington, D.C., Charles T. Gallagher, Chairman of the Boston School Committee.

The meeting was called to order by Edwin P. Seaver, Chairman of the Executive Committee, who made a brief statement of the purpose of the Conference, and called attention to the interesting display of the products of manual training and drawing which filled the rooms and corridors of the whole building.

Dr. Samuel Eliot was introduced as the presiding officer.

Dr. ELIOT.—Any meeting in the cause of education is interesting to our American people, and a meeting in the cause of one branch of education that has not yet been developed to its full extent seems peculiarly interesting. We come together to see what has been done, and to form some conjecture, at least, as to what is to be done. The exhibition of the results of manual training in this building will, I am sure, make a great many friends for the cause. Manual training is to be judged by its results, and the results gathered together here will persuade a great many persons that it is worthy of a far more respectful consideration than it has yet received.

I am heartily glad that we can speak of manual training and not of industrial training, as we did ten or fifteen years ago. Between the two there is a great and essential difference. Industrial training is training for the trades, for handicrafts. Manual training can demand the confidence of a large body of people who would not be disposed to place much trust in merely industrial training. If industrial training is to be given at all, it should be in trade-schools; and these should be open to such young people as once entered themselves with trades-people and mechanics as apprentices. But manual training can be given in any grade of any school. It is already given in our kindergartens and in a great many other places.

There are some things, as a judge of our Supreme Court once said to a young counsellor who was endeavoring to impress the court with the importance of his case and the principles which he conceived to

be embodied in it, "there are some things," said the venerable judge, "which the court may be supposed to understand." So there are some things which an intelligent audience may be supposed capable of understanding without any hint from those who are to speak to them; and I take for granted that those who are gathered in the interest of manual training know that it is already introduced in many schools, not only here, but in other parts of the country.

Manual training is in the first instance, and as its very name denotes, the training of the hand; but it is also the training of the eye, and to some extent of the ear, and to a much greater extent the training of the mind. It is for this reason that most of us who are interested in it are glad to have an opportunity to plead in its behalf. Were it only the training of the hand, and nothing more, I do not know that we should be justified in asking the great intelligent public to make much of it, or to give their support to it whenever they have an opportunity. But it has been proved over and over again by those who have witnessed manual training and its processes that it is not merely a training of the hand or of the senses alone, but it is the training of the mind, of the character; and any one who doubts it has only to go into the first good kindergarten, and he will discover that even at that early age the training of the mind and character is begun through the training of the hand and eye and ear. This is what entitles manual training to the support of the great body politic in which we live. It needs to be understood, and then it needs to be supported; and I am sure that those who are advocating it here, and who are doing so much for it everywhere, will prove the value of their cause without any further words. At the same time there is that natural desire of expression of public sympathy, that natural wish that the cause in which they find so much should be taken up by the public at large, that it should be found to deserve the countenance it has so far received and a great deal more.

If we were to ask ourselves where it began, we should have to go back a great many years, and indeed a great many centuries. It is the outgrowth of the scientific spirit which was first brought into action centuries ago, and which has since been steadily working upon education in all its grades and methods,—that spirit which endeavors to see things as they are, to penetrate the reality of all developments, not merely those that are to be found in school, but out of school; that spirit which seeks to understand things, to understand men, and therefore to understand life in general. This is at the bottom of all that has been proposed in manual training, and makes it a cause involving large variety of interests. We may indeed say that to a great extent the future of our communities turns on this. I am sure you will hear from those who are to speak a thousand reasons to convince you that the cause of manual training is one which it is worth while to comprehend, sustain, and make one's own.

It is my pleasant duty to ask you to listen to his Excellency the Governor of Massachusetts, William E. Russell.

ADDRESS OF GOVERNOR RUSSELL.

Ladies and Gentlemen,— Among the many invitations which sometimes perplex a governor with their urgent but kind solicitude, none has been more welcome to me than that which brings me here, because it gives me an opportunity to express my personal interest, and the interest, I believe, of the Commonwealth, in a matter of public importance which is the subject of your conference.

You will pardon me if I confess that I have come without a formal speech; for I am sure you know that the official engagements and social duties of the Governor permit him to accept but few invitations, and to those few he must respond with but little preparation. Indeed, I should hesitate to speak at all in the presence of this distinguished gathering of persons who have devoted themselves with signal ability and success to the cause of education, were it not that I can speak from some experience in the particular branch of education you are considering.

It was my good fortune, some three years ago, to be chosen as one of a committee who were to plan and establish a course of instruction in the Manual Training School at Cambridge, the generous gift of Mr. Rindge, and afterward to manage and control it.

It was the wish of the donor, heartily indorsed by the committee, that the benefits of this school should reach the poor rather than the well-to-do; that it should become a part of the public school system, and open wide its doors to all boys of proper age who wished, without cost to themselves, to make manual instruction part of their education.

Manual schools of a higher grade, such as the Institute of Technology, had already been established in many places, and had proved a great success; trade-schools like those established by Colonel Auchmuty in New York were known to be successful. But the school at Cambridge was nearly the first which was to meet and answer the practical question whether manual training could be made, and ought to be made, part of a public school system.

It provided that boys, upon graduation from the grammar school, at the age of about thirteen or fourteen, should have the option to enter the manual school and get manual instruction in connection with high-school studies. Their time was divided between the two schools. At the high school they pursued the usual studies, such as mathematics and physics, and at the manual school they were taught carpentry and joinery, forging, machine work, pattern-making, drawing, and other manual studies.

It is distinctly a school where the poor boy who wishes to become a skilled workman has every opportunity, during his school age, to get the necessary instruction. It is distinctly a school where the working-man can get, without expense, for his children while still children that practical instruction which fits them early to earn a livelihood and become self-supporting.

The school has proved a great success, not only in numbers, but in the ability, diligence, and discipline of the pupils. It has demonstrated the benefits of such instruction educationally in developing and training the intellectual faculties, and practically in giving instruction of

immediate use in after life. It has made better discipline, more self-control and self-reliance among the boys than I remember to have seen in any public school. Finally, it has shown conclusively that manual training can be made a successful part of public school instruction. To-day this school has the good will and good wishes of everybody in its community.

I confess that it is this phase of manual training that attracts my strongest interest and sympathy; namely, its offering its benefits freely to all. It is not manual training as a higher form of education to be purchased by the few, but manual training as plain, every-day instruction, giving its benefits to all who wish them, that makes this subject now of public importance, and of especial interest to the Commonwealth.

Because I believe this is the broad field it can and should occupy, I suggested to the legislature in my inaugural address that the time had come, in my judgment, when such education should be made a part of our public school system, open to all. With its merits and benefits abundantly proved, with a strong public sentiment in its favor, I believe the suggestion will meet the approval of the legislature, and some step this year will be taken in this direction. Of course, any step toward manual training must be taken carefully, after proper investigation, and limiting its adoption, perhaps, to those places where such education is specially needed, and then making it optional to the pupil rather than compulsory.

Pending the consideration of this subject by the State, and on the eve, I trust, of its adoption, it seems to me a happy suggestion that has brought this Conference of able and experienced educators together to discuss the matter in all its phases. I am sure much good will come from this Conference, not the least being increased public interest in the whole subject of manual training. I hope you will not overlook the question which seems to me of most public interest and practical importance; namely, how manual training can best be made part of our public school training.

Believing that the object of your Conference is for the best interest of our people and our Commonwealth, it is a pleasant duty and a privilege to extend her greeting to you, to welcome you among us, and to wish that abundant success may crown your work.

The cause of education is near and dear to the heart of our old Commonwealth. Freely she has given her treasure and the best of her ability to uphold and advance it, and to extend its blessing to all her children. Foremost she has ever been in promoting its interests, rightly believing that the education of all is the very foundation of free institutions and of a happy and prosperous Commonwealth.

The sturdy common sense and public spirit which led the founders of our Commonwealth to establish our public school system, that "learning," as they quaintly said, "might not be buried in the graves of our ancestors," I know will lead us to adopt such changes and reforms as will strengthen that system, increase and broaden its scope, and maintain it in its full vigor and usefulness.

Dr. ELIOT.—Brookline has established manual training in her schools, and it has proved of very great value. I am glad to introduce Mr. W. H. Lincoln, Chairman of the Brookline School Committee.

ADDRESS OF MR. W. H. LINCOLN,
CHAIRMAN OF THE BROOKLINE SCHOOL COMMITTEE.

Mr. Chairman, Ladies and Gentlemen,—It gives me great pleasure to be present on this occasion. I have for many years taken a deep interest in this subject; but I should not presume in this presence, and with my limited knowledge and experience, to undertake any formal presentation of this branch of public instruction. When I accepted the very kind invitation to attend this meeting, it was with the understanding I should say only a few words in an informal way, and, as a business man, expressing my opinion as to the value of this system of education in connection with our public schools, and more particularly with the grammar-school grades. It sometimes happens that even business men, while pursuing their business avocations, may be able to render some service to the cause of education. The chairman has kindly alluded in complimentary terms to the progress of the work of manual training in the neighboring town of Brookline. This work was the outgrowth of an industrial vacation school that had been established four years, where the boys were instructed in carpentry and the girls in cooking and sewing. The effect in this direction proved so successful that an attempt was made to provide for permanent instruction in this work, including it as a part of the regular school system. For this we are greatly indebted to the assistance of Professor Runkle. It was his hand that guided us, and we had the benefit of his experience in all the work we have undertaken; and, as a member of the Board, he has rendered most invaluable service.

The work began in the basement of the Lincoln School Building. Twenty-four benches were put in for the boys, and more systematic instruction was undertaken in the use of tools and in the progressive steps of carpentry. Rooms in the upper part of the building were also fitted for instruction in sewing and cooking. A success greater than we anticipated was the result of the first year's work, so that at the expiration of that year we were encouraged to present the facts to the town, and ask for an appropriation for the erection of a building adjoining the school-house, adapted especially for the purpose, and which should provide for instruction in drawing, carpentry, wood-turning, forging, and other work. The town, always liberal in all that relates to the education of its youth, adopted the recommendations of the School Committee. It was somewhat of a problem whether this work could be introduced successfully in all grades of the grammar school, and as to what effect it would have upon other branches of education. We devoted two hours every week to instruction in drawing, and four hours to education in carpentry, sewing, and cooking, making a total of six hours per week. The result proved that the other branches suffered no detriment; but, on the contrary, the pupils were so benefited by the course in manual training that their proficiency in other studies was greater than it had been in previous years. The study of form and drawing is now generally regarded as an essential part of the education of a child. It serves to cultivate the powers of observation, quickens the perceptions, and strengthens

the memory to such an extent that progress in all other studies is much more satisfactory and rapid.

Great changes have taken place in all the methods of teaching. Beginning with the kindergarten and extending all through the grades of grammar schools, teaching has been made more objective. The transition has been from the abstract to the concrete, and with good results. The children are deeply interested when engaged in this employment. They apply themselves with industry, and are impatient to succeed. In fact, it has developed an entirely new spirit among the scholars of the schools where it has been introduced, especially in the Lincoln School. This has become a new school since the introduction of this system a little more than two years ago. Therefore, I can speak confidently and hopefully in regard to the future. The great question is, By what means and in what manner can we best develop the special capacities and aptitudes of each pupil, so that, when they go into the world, they may more easily find their special spheres and become more self-dependent citizens? It is only a few evenings since I listened to an address upon a different subject, in which the speaker took occasion to remark that the latest "fad" in education was the driving of the plane and plying of the needle. If these applications were considered as an end in themselves, there might be some truth in the statement; but it is not with that in view that this system has been introduced, but wholly as a *means* to an end, so that the work the pupil can accomplish in this manual training school will enable him to perform any other work to better advantage. It is not that the boys must necessarily become carpenters and mechanics, or the girls dressmakers and cooks, but that they may be better fitted by this system for the duties of life, and be able to discharge whatever duties they may be called upon in the future to do in a better and more intelligent way. It is the *art* of drawing, of construction, the *art* of sewing, of cutting and designing, and the *art* of cooking that we teach under this system. In short, it renders education more complete and entire. Thus it commends itself to our thoughtful consideration and our earnest and hearty support.

Dr. ELIOT.—We are glad to hear what our next-door neighbor, Brookline, has done. Washington is almost next door, and I will call on Mr. W. B. Powell, Superintendent of Schools at Washington, to tell us what is being done there.

ADDRESS OF MR. POWELL.

Ladies and Gentlemen,—Washington having had a little experience in kindergarten work, realizing the benefits derived from the manual exercises of the kindergarten, believing that she saw many benefits arising to individuals and to the community at large from the technical schools of the higher grades, and realizing the changed and changing conditions of civilization because of inventions, the division of labor, the narrowing of the industries, the crowding of cities, the depleting of the country; has been trying to solve the question, "How can manual training be given to children in the grades of school between the kindergarten and the manual training school that is co-ordinate with the high school?"

The hand-work of the kindergarten was taken into the lower grades

of the primary schools; the drawing was changed from the reproduction of flats to the representation of objects, which involves accurate seeing; co-ordinate work of representing by stick-laying and paper-folding was put into the higher primary and the lower grammar grades; the construction of forms of card-board after work in drawing made by the children was required in the upper primary and in all of the grammar and high school grades; decoration was taught in all grades in which card-board forms were made; and, finally, a graduated system of clay modelling was introduced, embracing work from the lowest primary school to the highest high-school grade, both inclusive.

The experiment of sending the seventh and eighth grade boys to shops to do work at benches was then tried, after which corresponding work of a higher grade was begun in the high school. (The seventh and eighth grade schools are the two grades below the high school.)

The experiment showed the usefulness of the work and its practicability as a part of a graded system of school education.

All the seventh and eighth grade boys are now sent to shops or tool laboratories two hours a week for instruction. The girls of the same grades learn cooking for two hours a week. The third, fourth, and fifth grade girls are taught sewing one hour a week in the rooms in which they attend school, the teachers itinerating. The sixth-grade girls are sent to shops or laboratories where they learn to cut and fit.

Each shop, of whatever kind, is located to accommodate a community, or group, of grammar schools. A laboratory or shop for carpentry will accommodate twelve boys at a time. The boys leave their own school-rooms to go to the shop for a lesson. A teacher in one of these shops instructs three classes a day for five days in the week. Thus a carpenter's shop accommodates one hundred eighty boys. A cooking-school also accommodates a community, or group, of grammar schools. A class at this school consists of fifteen. In each school are taught three classes a day for five days of the week. Thus two hundred twenty-five pupils are instructed in a single school.

Twelve or fifteen girls constitute a class in the cutting and fitting schools.

These schools add very little relatively to the aggregate cost of instruction in the District of Columbia. Little more than one dollar per pupil is added to the aggregate expense of the schools.

What effect has this innovation had upon the schools? It has not interfered with the ordinary work, though some teachers feared that it would do so. They feared that the breaking up of a school to allow a class of fifteen to be away for two hours, and then at another time another class of fifteen to be gone two hours more, and then a third class, would so interrupt the programme of the school that harm would result.

It is now almost the universal testimony of the teachers that it is an advantage to have the classes so broken up. The teachers have an opportunity thereby to know their pupils better individually. They have an opportunity to come into personal contact with them. Opportunity is given to ascertain why a pupil does not recite as well as he should. Perhaps he does not know how to study. The routine of school is broken up, the programme is changed, the teacher is

forced down from the rostrum into the aisles among the pupils, where it may be seen how they work and where they may be helped to work more intelligently.

The work of the school has been better in every direction than it was before the introduction of manual training. The children, by a nearer relation with the things of life, have a better appreciation of what they try to learn from books.

Washington did not propose to put in manual training at the expense of anything else. She did not propose to teach trades, she did not propose to make skilled workmen of the children; but it was proposed to introduce manual training into the system to rank with other work or other studies, as a part of the curriculum. Manual training stands on a footing with other branches of education. We have never done anything in school that has given more general satisfaction than the introduction of manual training as a part of the system has given. It has met with no opposition. The legislators who vote the money — and, by the way, you pay for half of it: I am only reporting what we do with your money — give it to us willingly. We have met with no opposition from the supervisors, none from the Board of Education, none from parents, none from teachers, and none from pupils. The question is no longer, Shall manual training become a part of the system of public schools? but is, rather, How can it best be done? I hope and believe that the present Conference will help in the further solution of that question.

Dr. ELIOT.—One of the encouragements of public school work is the interest which the University takes in it. We have the President of Harvard College with us to-night to tell us of his knowledge and interest in this subject.

ADDRESS OF PRESIDENT CHARLES W. ELIOT.

Mr. President, Ladies and Gentlemen,—I must confess that I am not an impartial witness on this subject. I am full of prejudice about it. The wisdom of my parents caused me to be taught carpentry and turning in wood before I was fifteen years old, and while I was yet a member of the Boston Latin School. I have always been very glad indeed that I had that manual training when I was a boy. It has been of great use to me all my life, and a great pleasure. It was of use to me this morning; and I have no doubt it will be of use to me every week I live. That experience has given me a strong prejudice in favor of manual training for everybody.

Then later, after graduating at college, I became a chemist by profession. I had to study that difficult subject for years, and then I taught it for years. In every science a great deal of manual skill is necessary for the student and the teacher. The progress of the world in natural science during the last century has been greatly due to the trained senses—eyes, ears, noses, and fingers—of the experts in these sciences. That experience gave me another prejudice in favor of manual training for everybody.

Then for the last twenty years I have seen that one of the great improvements which have been wrought in education in all civilized countries has been the individualization of instruction, so as to meet

the precise needs and develop the capacities and powers of each individual at every stage of his development. Now, laboratory teaching and manual training are alike, in that they must be addressed to the individual. As Mr. Powell has just said, they break up class-work: they break up a routine which tends to become crushing, and bring the teacher directly into contact with the individual pupil. In this respect manual training does just what laboratory work does in chemistry, physiology, zoölogy, or botany. This consideration again prejudices me in favor of manual training.

I am old enough to remember when the brain was supposed to be the seat of the mind, just as the lungs were held to be the furnace that warms the body. I remember being taught that the animal heat was kept up in the lungs; but we all know better now. We know that wherever an atom is consumed, in whatever part of the body, there heat is generated, and, therefore, that the animal heat pervades the whole organism. It is just so with regard to the human mind: it pervades the body. It is not in the head, but it is all over the body; and, when you train the hand or the eye or the ear, you train the mind. As Governor Russell said, manual training is mental training. Never admit that manual training is anything distinguished from, or in opposition to, mental training. In the skill of the artist's hand, in the methodical, accurate movement of the mechanic's arm, in the acute observation through the physician's eye or ear, there is always mind. Therefore, there is no opposition between manual training, on the one hand, and mental training, on the other. We are simply training another kind of faculty,—not memory, but discriminating observation and correct perception. The old-fashioned education was chiefly devoted to the training of memory. Almost all the work which goes on to-day in the grammar school is memory-training. I am thankful for every variety which is introduced into that work. I am thankful for every effort to train the youth to correct observation, just discrimination, and accurate measurement.

There is another value in manual training, in that it trains the mind through success, through achievement, through doing something tangible and visible, and doing it well. When a boy has planed a parallelopiped of iron so well that no light shows under the edge of his try-square when he applies it to the faces of the block, he has done something which demands patience, attention, and care,—something which he can prove to be well done,—something which he can be proud of. There is mind in such work, and there is also sound morality in it.

For these reasons I hope that the experiment of manual training will go on and be developed in this city, as it already is in many other cities of this country.

I have lately seen that several Western cities are in advance of Boston in the development of manual training in the public schools. Two new cities of the North-west, Minneapolis and St. Paul, are each in advance of Boston in the development of this subject; but it is to be observed that the methods are still experimental. Each of these two cities, for instance, believes that it has the better method. One relies chiefly upon machine-work, and the other wholly upon hand-work.

Almost everywhere drawing is made an essential part of the manual

training course, and rightly; and it is partly on that account that I hope the manual training experiment will be greatly developed in this community, for drawing is indisputably one of the most useful intellectual exercises that can be offered to children. I have said that manual training is in the experimental stage. We have not yet learned whether carpentry is a better means of giving training in correct observation and in the nice use of finger and eye than chemical experimentation or physical experimentation with instruments of precision, such as are now used even in elementary instruction. I do not think the better way is as yet demonstrated; but teachers and students are pushing these inquiries in high schools, manual training schools, and scientific schools, and are in a fair way to arrive, in time, at just conclusions.

Further, I suppose it is a fair subject of experiment to discover at what age manual training may best be given to the young. If we were to judge by results,—that is, by the rapidity of the work and the merit of the product,—we should put that age late; but we might be in error in selecting that criterion. While, therefore, I admit that manual training is at the experimental stage, I think it is a subject which all intelligent communities should vigorously experiment with.

Dr. ELIOT.—Our School Committee has been vigorously experimenting with it of late; and I ask you to listen to the President of the School Committee, who represents that body, and who by his interest in drawing and in the administration of the Hawes Fund, which he has employed for the development of drawing, is abundantly qualified to speak of this subject of manual training.

ADDRESS OF MR. CHARLES T. GALLAGHER.

Mr. Chairman, Ladies and Gentlemen,—I am sincerely grateful to Dr. Eliot for letting me know what I am expected to speak to you about; but my embarrassment is that the educational interests of our schools are vested in the Superintendent and Board of Supervisors, and our School Committee is more of a legislative than an educational body, no educational test being required for membership. Our business consists largely of collecting from the City Council annually the sum of two million dollars and spending it as judiciously as we can, having sufficient knowledge of the details of our educational system to expend it properly. So that I cannot speak to you from the educational side, but will speak to you representing the School Committee of the City of Boston, and extending to you a cordial welcome at the opening of this magnificent industrial exhibit with which you have honored our English High School building; and, while we extend our cordial welcome, we extend our thanks to you that you have thus favored us in this our beloved city, which we feel is still the head and centre of educational work. In relation to the work of manual training and industrial education, I have only to say that, whatever may have been done by other cities and towns and even States, Boston is justly proud to state the fact that, at the Exposition of 1889 at Paris, the only *Grand Prix* awarded to any city, town, or State, or any educational system in the United States, was awarded to Boston's exhibit; and, in addition thereto, Boston was awarded a gold medal.

These awards were made largely on account of the Evening Drawing School exhibit and other industrial work of our school system, of course the rest of the exhibit contributing also toward the general result. Although the city of Boston can boast no building set apart especially for manual training, we have taught in our day schools cooking, sewing and dressmaking, and carpentry and sloyd work to a certain extent, while the kindergartens are now a flourishing part of our system. We congratulate ourselves that this manual instruction will soon receive an impetus in the shape of a Mechanic Arts High School, for which an appropriation for the building and land has been recommended by his Honor the Mayor. To be sure, we may be beginning at the wrong end; but it will develop ultimately into a general system of manual training. Our city now provides preparation for a mercantile education in this part of this school building, and in the other side it fits a boy for a university education. There is every reason why our boys should be provided also with the means to learn something of color, size, and form, and have the benefits of a high school of the manual training kind; and that we propose to give them. At a meeting of the Old School-boys' Association, where every member must have attended a Boston school fifty or more years ago, I was present as an invited guest, and there a kind-hearted old gentleman made the statement that he did not believe that boys came out of school now as well equipped as when he was a boy; and he cited instances to prove his remark. As well as I could in courtesy, I endeavored to show that he could not praise or blame the public schools in either instance, that the fault to-day (if there is a fault) was that the boy did not receive the instruction in manual and industrial education outside of school that he did in those days. For, in the days of that kind-hearted old gentleman, like the boy in the country to-day, he began at four years of age to do all sorts of chores, and his training outside of school began with driving the cows to pasture, leading horses to water, working in the fields and buildings about the farm, repairing his own tools and sometimes making them, or assisting in the shop or at his father's bench or in the store; and in a dozen different positions he was learning all the time, crudely and without knowing it,—a development of eye, ear, and hand that helped him in his studies at school and in after life. It is to supply something of that kind that we now need systematical manual training in this and other great cities, for there is no longer any opportunity for outside work; and thus we can assist to develop boys whose general routine of life consists of eating, sleeping, going to school, and keeping out of the way in the streets. For, in a city like Boston, in more than three-fourths of its territory, more than three-fourths of the boys have no such opportunity out of school as the old gentleman had who made the statement that he did. My claim is that the city boy of to-day has not half the chance that the country boy has, or the boys of those times had when the city was little more than a large village.

Boston has not made as rapid advance in manual training for the past years as the School Committee would like to have seen, for the reason that we have been spending about as much money per year as the tax-payer will stand; and the problem with the city government has been, not how to add new things, but how the manual appropria-

tion and our estimates can be cut down. But we have made a start now; and we will not recede, particularly after such an impetus as your exhibit will give us.

Dr. Eliot has referred to two things,—my connection with the Drawing Committee and to the fund of which I am a trustee in South Boston. As to the drawing in our schools, I can only refer you to the exhibit in the hall below, from our Evening Drawing Schools; and we claim that it will compare favorably with like work anywhere in the country, and the results at Paris, at San Francisco and elsewhere, have demonstrated the fact. We are fortunate in our director and corps of instructors; and the work is being carried on with the true industrial spirit, looking to a system of manual training. In relation to the fund in South Boston, I have to say that there lived an old gentleman named John Hawes, who never went to school after he was nine years old, and who felt that something ought to be done educationally for that section of the city. He died in 1830, leaving two large farms, one-half of the income from the same to be forever used for free education, etc., of the residents of South Boston. By prudent handling of the property by the trustees (who have done their work as a charity, just as the School Committee do) the property has increased now to between three and four hundred thousand dollars. One-half of the income is used for educational purposes; and we have established a fully equipped system of free Evening Drawing Schools, where mechanical and free-hand drawing, modelling in clay, drawing from life, water-color painting, yacht and ship designing, form a part of the system. We have in addition free classes in phonography and in vocal and physical culture. In fact, we supply what the city of Boston does not for that section of the city in public education. What we hope and expect to do, when the city of Boston has given us a model, is to establish a permanent manual training school. We have forty thousand dollars accumulated income, a large old building that we can turn into a school, and twenty thousand feet of land. We are only waiting for the details of such a plan to come to us, that we may be in line and touch with the rest of you in this good work.

I close by extending to you all a most cordial welcome to this our building, and hope that the results of this Conference may be as fruit-bearing and beneficial as your exhibit is complete and interesting.

Dr. SAMUEL ELIOT.—The various addresses thus far have been given by persons identified with school work. We want a response from the body of the people, and no one can make that more appropriately than Rev. Charles G. Ames.

Mr. AMES.—I think there is a kind of injustice to the people who have remained until half-past nine in asking them to stay and listen to any more; and I shall earn a vote of thanks by declining to speak. I think it is physical intemperance to have so much meeting all at once.

Dr. ELIOT.—Mr. Ames must hold himself bound to appear at some morning or afternoon session during the Conference.

Adjourned at 9.30 P.M.

Second Session.

Thursday Morning, April 9, 1891.

The second session was called to order by General Francis A. Walker, who had been invited to preside over the Conference. President Walker called attention to the exhibits of school work to be found in the several rooms of the building, and then introduced Professor Robert H. Richards, of the Institute of Technology, who read the following paper:—

MANUAL TRAINING AS AN INSPIRATION TO MENTAL DEVELOPMENT.

BY ROBERT H. RICHARDS.

In discussing manual training before you to-day, I do not indulge in the hope that I shall be so fortunate as to say anything that is new. I believe, however, I can attack this problem from an entirely different standpoint from that taken by others; namely, as a representative of one of the class of boys to whom manual training would have been an especial boon, had it been developed thirty-five years ago.

My paper will therefore begin with manual training as an inspiration to mental development, and, since my name has been honored by the first place on the list in the present programme, I think it will be quite proper for me to say a few words upon the following topics also: "The Choice of Materials for Manual Training," "The Definition of Trade-schools," and "Manual Training Schools both Swedish and Russian, and the Uses of them."

I feel still further that I have sufficient reason for speaking of these in the fact that people's minds always drift toward a trade-school, whenever tool-work is spoken of. We cannot, therefore, too often emphasize the statement that manual training is intellectual training,—teaching the child how to think.

I will now take the liberty to refer to such portions of my own personal history as seem to bear upon manual training as an inspiration to mental development.

Up to twenty-one years of age I was the dunce of every school I attended. But, while I was doing nothing with books, my mind was always active. I was actively interested in learning about nature, and in boys' out-of-door sports. I well remember the labor that was expended upon me to try to teach me how to read. My teacher put the book upside down in front of me, and left me half an hour. She then returned, and said, "Robert, are you studying?" I answered, "Yes, as hard as I can." She pointed to the book, which was still

upside down. I cried when I found how I had deceived her. How, then, could I have told her such a lie, when I believed I was telling her the truth? My answer is that there was an obstacle between me and the reading which was invisible to the teacher and indescribable by me.

Various attempts were made to give me a good start at school in this country, and later in England, with little success from the school-teacher's point of view. At fifteen years of age, while living in the south of England, a Cambridge University man was engaged as private tutor to myself and brother. He *made* me study, and he made me recite. By his will he forced me to overcome the barrier between me and my lessons. After lessons he read Grimms' "Household Tales" to us, and other stories which fired the youthful imagination. He took us long walks to the woods, the fields, the swamps, and the streams. We named all the wild places we visited, from the incidents he had read to us. I remember to-day where Philip Slingsby slew the dragon. We also watched the habits of birds and insects, and many an interesting fact was stored up in this way.

At the end of the year we went to school at Wellington College, a school modelled on the lines of Rugby. All personal pressure was removed, and now, as formerly, my lessons were never learned. The same barrier, the same missing link, was between me and my books; and my promise to my mother that I would do my very best was of no avail, on account of it. At this time I learned to be a pretty good cricketer and foot-ball player; but my rambles in the woods, by the streams and lakes, over the heather, watching the habits of birds and animals, collecting insects, were my chief delight.

The custom of the school was to hold out prizes as inducements to the boys to work, the dead languages not having sufficient attractions even for the bright boys. I earned one prize by good conduct at drill; and when my master, for whom I had a warm regard, invited me to select my prize, he having just pointed out a Longfellow or a Shakspeare to a bright boy who preceded me, said to me, with almost a sneer, Here is a book on toads and frogs: I suppose *you* will like that, I took the book with my teeth shut and my fists clenched, when I felt the sting of his remark, which showed me that, in his opinion, if I was learning anything at the school, that something was beneath his consideration.

At nineteen years of age I went to Phillips Academy at Exeter, N.H., and while there I studied as hard as I have ever studied. It was, however, wholly up-hill work; and I remained at the foot of my class, in spite of my efforts. While in England, I did not study, because my mind was on other things. When at Exeter, I tried hard to study, and failed because no comprehensible reason could be given me for the study of the dead languages. I never could see the use of Latin and Greek, and no teacher was able to make their use plain to my mind. The answer always came to me, "I tell you it is good for you, and you must do as I tell you."

When twenty-one years of age, I finally went to the Massachusetts Institute of Technology. The school was just opened. There were six other pupils besides myself. With them I immediately began the

study of chemistry, geology, mineralogy, surveying, physics, and drawing, by laboratory and field work accompanied by lectures. Almost the very day I reached the Institute the scales began to drop from my eyes; and I began to see for the first time what a school was for, and that its main duty was not to worry slow boys. I began to see that French and German were of use, for they helped the study of chemistry. I found that chemical books were of use, because they told me how my laboratory work was to be done, and why it was to be done so. Chemistry opened my eyes to the wonderful labyrinth, ever widening in all directions, of that department of nature. Physics enchanted me with its wonderful and varied range of phenomena. In fact, I found that the new school was teaching me nature, which I had been learning how to love and to study all my life, was teaching me nature by direct contact, and that mathematics, language, and history were nothing but the means to that end. The whole aspect of school life was at once inverted. I now studied because I could not help it, while I had previously studied because I knew I ought to want to study. My barrier was gone; and why? I was now converting, not print, but observation, into thought, and thought into acts (drawings, experiments, field-work). My books became merely a tool to help me convert observation into thought. The use of books being at last found out, I could not read or study enough to satisfy my craving for knowledge, experience, and skill.

I think at the time I told that lie about my lesson that I was designing a culvert for my little road that I had made on which I drove my toy carriages. I am still troubled with my mind wandering off from the business in hand. I had, while I was writing this very paper, an idea strike me which interfered seriously with my work upon the paper. I had to work it out before I could leave it; and the result of it is I have invented a new objective for a surveying instrument, which looks now as if it would become quite an important addition to the plane table and stadia work of the civil engineer. This absent-mindedness is a very troublesome quality to have.

Soon after graduating from the Institute, President Runkle placed me in charge of the designing, equipping, and managing the new mining laboratory of the Institute. I knew only the little that a graduate from a very imperfect course in mining and metallurgy might be expected to know, and that hampered by the fact that I was naturally slow at books. I once heard Professor Runkle remark, "How wonderful it is that Richards should have such an aptitude for designing apparatus and arranging the practical side of this mining course!" Professor Runkle did not know that I had spent the first twenty-one years of my life in learning how to observe, and that, however little guided, however unsystematic, however much looked down upon by my teachers for doing it, I had gained a great deal; and the gain that I had made was beginning to show in results. I do not know how to account for my extreme difficulty in learning. I have heard no physiological theory to explain it. I think, however, that it is in this way: the step one takes in converting the printed page of a book into thought is a very wide leap, probably the widest leap a child ever has to make. If I were told to jump a stream twenty-five feet wide, I should not even try to do it, knowing the

jump impossible; but, if stepping-stones were put in, three feet apart, I could cross the stream with ease and pleasure. I think the Institute of Technology put in the missing stepping-stones, and converted the study which had always been to me a hated task, done only from love for my mother, into an active, living, and intense interest.

Now, how could this be? How could one school make ideas so clear, when another school had not done so? Let me see if I can answer this question. If I convert a page of print into thought, I require to read the page perhaps several times, making notes as I go, taking me some minutes, perhaps hours, to understand it. If I convert a working drawing into thought, I glance at it, again a second time,—yes, I understand perfectly. Seconds only are required. The written description of an object that would take minutes, perhaps hours, to understand, is acquired more perfectly by a few seconds from the drawing. In fact, drawing is a separate language by which ideas are conveyed with but a very small expenditure of time and effort, compared with print. But, still better, it is a universal language. The American can talk to the Russian by a drawing as fluently as though they had been born and bred in the same country. Drawing becomes, therefore, a means of cultivating the intellectual faculty; and we must now consider how it can best accomplish this end. Free-hand sketching is good. So also is mechanical drawing. They cultivate the hand and the eye to accurate observation and reproduction, as well as the eye for beauty.

The act of making objects by copying from a like model does the same thing. But when a child makes a drawing from an object, and then makes an object from that drawing, he has derived not only the advantages from both, but he has done a great deal more: he has found out the use of one of the greatest tools of modern progress,—namely, a working drawing. The working drawing is, in my opinion, the grand central idea around which all the practical hand-work of the school should be crystallized.

Later I expect to demonstrate the fact that a course can be so laid out as to lead the boy gradually to a perfect understanding of it.

I do not think my experience is extraordinary or unique. I fancy every school has in it just such boys as I was. For them this new scheme of object-teaching is of the highest importance, as it gives them the stepping-stones so much needed. On the other hand, for the bright boys, the new system serves to give them a chance to measure themselves alongside of their neighbors by some other standard than their speed of converting print into thought; and it gives them a chance to see that there are some things in the world to be done that require a little care, a little time, a little thought, and a little patience, all of which are most excellent lessons for the bright, swift thinker to learn. I heard a master of one of the public schools of Boston, whose pupils were taking a course in wood-work at the Eliot School in Jamaica Plain, remark that he had a number of dull boys that he could do nothing with. Shortly after the carpentry began they suddenly seemed to open out and understand what their lessons were for.

In my teaching at the Institute of Technology, I have had in-

stances of boys, the finest and brightest from the usual teacher's standpoint, who, while they could outrank all their neighbors in the school, have taken longer and found it harder to adapt themselves to the world's demands than any others.

So far for my reasons why I favor manual training. I will now go to the materials and the courses of instruction.

If now we admit that some experience with things, some chance to cultivate observing, recording, collating, and the drawing of conclusions, is good for boys, whether they are quick or slow, whether they are good or bad, how shall we choose a scheme of things? How shall we choose a material for the course? Here we are, crowded into great cities. We cannot use the country fields, woods, streams, etc., or even the country blacksmith's shop or carpenter's shop: our numbers are too great, and the country too far away. Natural history is largely ruled out, and experimental science is too abstruse and also expensive. We come down to the making of objects as the simplest and most available plan.

In choosing material, we shall have to rule out most of the trades, as the special machinery and materials used cost too much. We naturally come to the common materials of construction, wood, cast iron, wrought iron. These seem to answer the purpose from both points of view—cheapness and availability—better than any others. All houses and buildings, as well as engineering construction, are largely, if not wholly, made of these materials. It is difficult to imagine a person so placed that a knowledge of the properties of the three great construction materials—wood, wrought iron, and cast iron—should not be of great value to him, whether he be a laborer, a politician, a watchmaker, a lawyer, an engineer, a physician, or a minister. If, then, the child can obtain a practical knowledge of the common materials and tools of daily life while he is getting his intellectual training from them, how much greater the benefit of the course! So much for the materials.

Permit me now for a few moments to consider the schemes of instruction that are before the public.

There are two principal ways of teaching the properties and modes of using materials. One is called the trade-school. The other is called the manual training school; and of this there are two varieties now before the public,—Swedish manual training, or sloyd, and Russian manual training.

How shall we apply this system of tool-work? Shall we adopt a trade-school, a Swedish manual training, or a Russian manual training school? The newspapers are talking about all of these different schools. Which shall we adopt for our Boston boys and girls?

In order to answer this question we shall have to see what the difference is between these systems.

First, let us consider the trade-school. Here the pupil must be taught upon life-size scale. The pieces he works upon must be as large as they would be in practice. The stock will be a great expense. To pay for this, we must have the boy make a large number of any article that he has learned how to make, in order that the expense of his early clumsiness may be paid for through his later skill by the sale of the articles he has made. The school, then, must become

a factory, of which *goods*, and not boys, are the principal products. That alone is enough to condemn trade schools for boys and girls. The main object for which a tax-payer supports the public school is that the boys and girls may be educated to the best advantage, not that the doors and bedsteads, chairs, etc., that the school produces, may be salable.

Again, suppose in our public schools, where we may have the children one-half day per week on manual training, we tried to teach the trade of carpentry. We will say that we start the class in making chests of drawers, in September. They require the first month to make the first dovetailed corner of the first drawer. The dovetails are horrible to look at. The next month, perhaps, they make the other three dovetails of the first drawer, each one better than the last; but the drawer will not lie down flat: it is up at one corner and down at the next. Each new piece the boy makes better than the last; and, if he has been so fortunate as to get through his chest of drawers at the end of the year, it will not be a satisfactory job,—it will be a history of his advancing skill, beginning with the poorest workmanship at one corner, going on until the last degree of skill was obtained. He will have worked all the year with his early failures staring him in the face, and telling him that his year's work must be a failure, however hard he may try. The fact is, the time is too limited to make him a carpenter, even if we wished to make him one, which we do not.

Let us now look at a trade-school from another point of view. If we put in a shoemaking course in the public schools, we may either have a good, enthusiastic teacher or a poor, indifferent one. If the latter, the course would amount to nothing, and had better be left out; but, if the former, observe the consequences: all the children would rush into the course. The course would be the largest and most popular of all the elective departments. The city would soon be flooded with young, only partly fledged shoemakers; and then the trades-union would step in, and the imperial voter would say, "Stop! we can't have this."

Again, observe that the masons' trade would say to City Hall, "We refuse to pay taxes to support a shoemakers' school, when you do not give us a masons' school to teach our boys." Whichever side of the fence the voter is, he has a well-defined cause for grumbling.

We may say, then, for lack of time, from high cost, from political reasons, from total inappropriateness, a trade-school is not suitable to the public school system for boys or girls.

Professor Runkle tells me that this trade-school idea was tried at the great Technical School at Moscow from about 1844 to 1868, that it failed through that whole period to produce the effects sought, and that in 1868 the Russian manual training in wood was first started, which has since that time produced such wonderful results in brightening up dull boys and in ballasting bright boys. There are places for trade-schools, and they have their uses. For instance, in a large city like New York, there are many paupers, some of them, perhaps most of them, supported by charity or in the reformatory. There are some of them, however, who, if they were given a trade, would go to work and earn their living, and be glad to do it. A trade-school for

nearly or quite grown up men under those circumstances, if discreetly managed, will be a success.

Again, a trade-school is quite in place where a large firm or company find they have a deficit of a certain class of skilled labor, and it is cheaper and better to educate than to import. In certain districts of England and Germany, where the whole town is devoted to one kind of manufacture,—as weaving, for instance,—very successful trade-schools exist. They fill a very important want, and do not flood the market, because the market is so very large.

We now come to the various kinds of manual training, of which the Swedish and the Russian manual training are the two most prominent examples. These systems do not strive to teach any trade at all. They strive to teach the principles which underlie all trades. They bear the same relation to trade-schools that the modern inductive scientific method of thought does to the old rule-of-thumb method,—do this because your grandfather did it so. If it was good enough for your grandfather, it is good enough for you.

Manual training is part and parcel of the great modern movement which is coming into everything; namely, observe, record, collate, conclude. And, so long as this mental faculty is seized upon and developed in the child, I do not care whether he makes a complete chest of drawers or only one corner of one drawer. It is the boy we are making, not furniture.

Let us now make an analytical comparison between the Swedish and Russian methods. The Swedish makes finished articles. The Russian makes mainly typical pieces, with only an occasional finished piece. They are both progressive; that is, advance by steps from simpler to more complex. The Swedish selects its course from the small wooden articles used in the house and garden. It teaches symmetry of form. The Russian selects the various fittings used by the carpenter in building and furnishing a house. It teaches exactness of fit. The pieces judge themselves. The Swedish seeks to please the child by the value of the article he carries home, and to develop him by progressive steps in tools and work. The Russian seeks to awaken a child by preliminary work, and to charm him by his own development. The Swedish uses the drawing only on the piece. The Russian uses the working drawing independently of the piece. The Swedish is accepted by all children of ten years: it is a delight to them, and there is no difficulty in keeping up their interest during the early stages. The interest, however, can hardly last through a series of years. The Russian is apt to flag a little at first, with boys of even twelve years, before the effect has been produced and the idea absorbed; but, as soon as the child's mind has begun to react, advancement is a delight to both teacher and pupil. Pupils who at the start clamored for finished pieces come later and say: "I was mistaken, you knew best." "I am satisfied the course is much better than if I were making finished pieces."

As to the appropriateness of one or another course, I think we may obtain some light in this way: A child needs the incentive of the finished piece when he is young,—say ten to twelve years. On the other hand, the introduction of working drawings and the exercise of the intellectual faculty of thinking out how intricate mortises and

other fittings can be made, while they would fall flat on a child of ten to twelve years old, are thoroughly appreciated and profited by in the case of a child of thirteen to fifteen years,—the older, the more so. Therefore, we find in the very principles which control each of these systems the strongly indicated opinion that the Swedish should come earlier, say ten to twelve, and the Russian later, say thirteen to fifteen.

Having now compared the Swedish and Russian methods, what are we to advise? Clearly, we need them both. Shall we take them unchanged as they are from abroad? Let us look at experience. Can any foreign manufactory succeed in this country without proper adaptation? Answer, No, never. Can any foreign institution be imported without change, and succeed in this country without at first being adapted to the genius of our people? Answer, No, never. There is clearly here a double reason for adaptation. The two schemes will both need to be adapted to our country, but they must also be adapted to each other. In my opinion, the best adaptation will be reached by studying the needs of each system, with a view to ascertain whether they cannot supplement, adapt, and strengthen each other. For instance, we may look for the weak and the strong points of each system, and then see if we cannot so weld them together that the strong points of the one system supplement the weak points of the other. I think a little welding or splicing between the ends of these two courses will be found to remove the weak points of both, and, as a result, give us one continuous whole, strong at every point, which will hold the interest and enthusiasm of the pupils throughout the last four years of the grammar school. In order to put this question to the test, let us place Swedish sloyd in the grammar school curriculum, between ten and twelve years, and the Russian between thirteen and fifteen years.

Now, let us see where the weak points of the two systems are. We see at once that toward the end of sloyd the pupil's interest is liable to wane, and at the beginning of the Russian the working drawing is uphill work and hard for the child at first. How can these two weak ends which come together be welded so as to mutually strengthen each other? This can be done by making the working drawing the grand final climax toward which both these courses lead.

Suppose, for instance, that sloyd be asked to recast its progressive order, which is now done upon a principle which in idea, but not in fact, may be expressed by saying:—

Lesson one, whittle on one side of a stick, one surface.

Lesson two, whittle on two sides of a stick, two surfaces, one edge.

Lesson three, whittle on two sides and end of a stick, three surfaces, three edges.

Lesson four, use knife and file on a stick.

Lesson five, use knife, file, and sandpaper on a stick; and so on, adding an exercise or a tool at every new piece.

Let the course as it now is be recast around the central idea of a final working drawing. To do this, place together for the ten-year-old boys all the pieces which work upon *two-dimension stuff*, say one-fourth inch thick. The boy draws his piece upon the wood, making the

simple horizontal projection of it. Let the pieces be so laid out that the work will be progressive in every sense that Swedish work is progressive. The pupil will here learn to draw plane pieces, and to cut them out accurately, and to make finished objects by combining them; and, over and above all the other benefits of the course, he will acquire the idea of the *plan* of an object: we may well call this two-dimension work.

The eleven-year-old pupil is given *three-dimension work*, on thicker stock. He draws sections on the face, the side, and the end of the piece, and then works down to the finished shape. For this purpose, all of the sloyd pieces suitable for this work are arranged in series, going from simple to more complex. During this year he has learned the idea of the *plan*, the *elevation*, and the *end view* of the object, but does not yet know that he has learned them.

The twelve or thirteen year old pupil now begins the Russian course with his working drawings, the difficulty of which has entirely vanished because his two previous years have led him up to it. He has been learning the principles of the working drawing without knowing that he was learning them. The difficulty at the beginning of the Russian scheme is therefore entirely removed.

The sloyd pieces that call out the artistic qualities of the child may be suitably interspersed throughout the course without conflicting with the working drawing idea. Perhaps the greatest charm of all in this manual training is the ease with which a child may be brought, at stated stages in his advancement, to attitudes where he knows more than he thinks he does. The discovery which follows is a very great delight and incentive to progress.

The Russian set of pieces has already been worked out for a two years' course, and it will therefore provide for the remainder of the grammar school curriculum.

We have thus reached a finished working drawing as the climax toward which the four years have been systematically tending, and which is not only one of the greatest tools of modern progress, but also is a new mode of thought expression, a universal language. There is no reason why a fourteen-year-old boy who has been through these four years should not understand an ordinary simple working drawing as well as an engineer of thirty years does now, and he has been gaining besides all the advantages of the tool course; namely, skill, accuracy, thoroughness, and mental power throughout the entire course.

In conclusion, I wish to say, I do not claim originality for anything contained in this paper. The ideas are all in the very air we breathe. Perhaps of all the friends to whom I am indebted, I am more so to Professor Runkle and Mr. MacAlister, both of whom have helped me greatly. I wish also to mention Mr. F. M. Leavitt of the Eliot School in Jamaica Plain, who has been the living, connecting link between me and manual training for the last two years. Many of his ideas are embodied in this paper.

Finally, I wish to say that, while it may have seemed to outsiders that Boston was not progressing as rapidly as other cities in these matters, there has not been a time since the first school was opened in 1876 till the present moment when there has not been pioneer

work going on in these lines: all of it has been in the right direction, and all of it good. It may not be, any of it, the exact final scheme which the city shall adopt; but it has been ploughing the furrow, and sowing the seed, which is to give Boston a good system, and, while doing so, it has been for the boys who have received the training an inspiration to mental development in a degree that words can hardly express.

A paper on SLOYD, by Miss Elizabeth Josephine Woodward, was read by Mr. Seaver, who stated that the paper was a record of carefully conducted experiments in a well-known school. The following is the paper:—

SLOYD.

BY ELIZABETH JOSEPHINE WOODWARD.

Ten years ago there was established in Boston a private school which embodied ideas then considered experimental, even dangerously so, in the education of little children. "Nature study," careful seeing, doing, and telling, was the basis of the school work. There was the belief, too, that work in wood, educationally taught, might be a valuable factor in the development of the child; that there must come a time when his outreaching strength of mind and of body required a less plastic material than clay or paper; that the moral value of honest work and persevering effort might be here taught on a plane where the standard of teacher and pupil are more evidently the same than in literary studies.

At that time the kindergarten and its advanced work provided for the mental, moral, and physical development of the child up to the age of eight years. At fourteen a fine system of manual training, based on the one side upon the psychological and physical needs of the boy, and on the other side upon the analysis of tools and processes, led him through general to special training.

Between eight and fourteen there was a break. During this period of six years, when formative influences are of incalculable importance, there was no direct hand training, nothing to connect the child with the external world, nothing to develop the brain through the hand. This break between the kindergarten and the manual training school was recognized and deplored by those who believed that "the principles of Froebel are not merely adapted to elementary schools and kindergartens," but "should penetrate the primary school and even general education."

The circumstances of the school under consideration were such that whatever seemed likely to be of real and permanent value could be given a trial upon a scale sufficiently large to form a basis for future opinions and decisions.

In 1882 rooms were fitted with tools and benches, and wood-work was introduced into three primary classes, in which the children were seven, eight, and nine years of age. "Carpentry" it was called on the schedule of the school; but to those directly concerned in the work, and to those whose zeal was its inspiration, it meant what the best thought and experience of these later years have taught us to

understand by manual training. As there was no precedent for such classes, the principles upon which other teaching depends were made the basis of this new venture. The method was a class lesson, supplemented by individual instruction. Instruction was given by the class teacher. The work was intended to progress in unbroken continuity from simple to complex, from easy to difficult. The pedagogical instinct of its founder led to the adoption from the kindergarten of the principle that the objects made must be articles of use.

Four years the work went on as begun. During all this period criticism of the work and of the methods was invited from those who were making similar studies. The best work done in other cities was visited and carefully examined.

Certain good results had been attained.

1. The children were happy, interested, patient, and persevering.
2. There was a gain in accuracy.
3. By contact with material, facts of solid, surface, and line, were impressed.

It was now thought wiser to carry on the paper work of the kindergarten until the child was eight years old, and to let him go to the work-room for the first time at the beginning of his third year in the primary school. Those who were watching the experiment with the keenest interest knew that the children were not gaining all the development possible for manual training to give; and with renewed earnestness the cause was sought where the greatest fault was believed to exist,—that is, *in the models*. They were, originally, few in number. The first was a small set of shelves, of prepared wood, requiring six or seven pieces; the second, a bracket of three pieces; the third, a larger set of shelves, of six pieces. It had not taken four years to demonstrate that these were not wholly suited to the needs of the young child, for the following reasons:—

First. They consisted of too many pieces. The child is easily discouraged by failure; and the necessity of making two or more pieces exactly alike, or which must fit together accurately, is a problem great enough to baffle, and perhaps destroy, the interest in his work which is natural and essential to happy, healthy childhood.

Second. They required too long a time for completion. The keen interest of the child was dulled by the length of time during which it had to be sustained. His imagination could not hold the finished article before him while he was perfecting one of its elements.

Third. They repeated too frequently the same physical exercises.

One need, then, was more and simpler models, involving a greater variety of exercises.

In another city there was found in successful operation, with classes of grammar grade, a system of wood-work based upon carefully progressive exercises. Articles of use, in miniature, were occasionally produced incidentally. In a modified form, this system was introduced into the private school which we are considering. Its valuable points were at once acknowledged: (a) The same exercise was frequently repeated, but with such varied conditions that it did not become monotonous or wearisome. (b) Each problem had one definite aim, and this was made perfectly clear to the child by the statement of its conditions. (c) The combined work was comparatively simple.

Almost as quickly one defect became evident. The physical requirements were not great enough to offer suitable resistance to the strength of the child. Further experience showed that the exercises were too mechanical; that the thought of the child was too little called upon; that exercises alone could not satisfy the child's creative instinct: he rebelled against "doing" which did not result in "making." With the partial adoption of the new system, some of the old models were retained, a few others added, and in this way work went on until 1888.

At one time footstools were required by one of the grammar classes, and the primary classes were invited to make them. The eagerness with which the invitation was accepted was but the indication of the spirit in which the work was done. Those who saw the faces of the children as they presented the footstools to the teacher who had asked for them can never forget the expression of pure delight in being of use to the little world about them.

These years of experience were of great value to the teachers. As there was no literature to aid them save that of the kindergarten and of the manual training school, the ideas of the one had to be carried forward, those of the other greatly modified, ere either could be applied to children of eight and nine. There were but one or two schools in this country with which they could compare their work. This experience, this study, this comparison, led to the recognition of certain needs, and of certain principles, upon which their fulfilment must rest.

It was believed: first, that manual training is a valuable and necessary part of the child's entire school life; second, that the teacher has, in the manual training hour, an opportunity for the moral and mental training of the pupil which does not come to her in the same degree in any one study; third, that, while the principles and processes involved should be so simple and so progressive that the child may be constantly encouraged and may thereby gain self-reliance and self-respect, the exercises upon the model should have such physical requirements that the bodily powers should be continually developed; fourth, that there should be many models, and that for the youngest children these should consist each of a single piece; fifth, that exercises alone fail to interest the young child, and that the creative instinct and the love of helpfulness require that the objects made should be of actual use.

With this understanding of some of the principles upon which the best work should rest, there came to these teachers an opportunity to study the Swedish sloyd.

About three years ago there came from Sweden a gentleman who wished to awaken an interest in the Swedish sloyd. The interest awaited him; for the attention of certain educators had for some time been directed to the work going on under Herr Salomon, at Nääs.

For the first suggestion of the value of manual work in the training of children we must go back to Luther and Comenius, and to Rousseau for the emphasis which he laid upon its educational bearing. Down through a line of illustrious names this idea wove itself until about 1858, when Uno Cygnaeus, of Finland, himself imbued with the spirit of Pestalozzi and Froebel, clearly recognized the

pedagogical value of manual training, and directed the force of his remarkable personality toward putting those ideas into practice in the schools of his native country and in those of Sweden and Germany.

It is worthy of note that his warmest and at first his only disciples in Europe were those who had already accepted the kindergarten. Although the spirit and the achievements of Cygnaeus are royally recognized by Herr Salomon, the Swedish sloyd is a spontaneous growth of Swedish soil.

The word "sloyd," untranslatable except etymologically, conveys to the mind of the Swede the idea of work done with the hand, at school, and for educational purposes solely, the result of the work to be the child's contribution to the home life. Sloyd claimed to be the best educational system of manual training for young children.

The needs disclosed by six years of experience questioned point by point its claims. Was this, perhaps, the thing for which this school had so long sought? The teachers believed that to accomplish the desired result, the child must be interested. The sloyd claimed this as a fundamental principle. They believed manual training to be a necessity of the child's entire school life. Sloyd was intended to fill the six waiting, neglected years. They had begun to learn the moral value of manual training. Sloyd, it was claimed, would lead to love for labor, industry, persistence, honesty, self-reliance, self-respect, and respect for honest bodily toil. They had learned that simple progressive exercises, calling forth in gradual development the mental and physical powers, must be the basis of the models used. The sloyd said, "Exercises on the models must progress without break from easy to difficult, and in such order that by means of the preceding exercises the pupil may attain the necessary skill to make the models that follow, without direct help." And further: "At the beginning of the series the models should be so constructed that they can be quickly executed, and few tools should be used. As the work progresses, there should be gradual increase in the manipulations and in the number of tools."

The teachers believed most firmly that for young children the models should be articles of use. Upon this principle and the great moral value which it possessed, the sloyd based its strongest claim. In accordance with the belief in these principles, sloyd was introduced into this school in the autumn of 1888. The results of this and other experiments in sloyd were so satisfactory that after careful deliberation arrangements were made for the teaching of sloyd in all the older classes of the school.

With the little ones the results have been better than had been thought possible. Physically, the work is adapted to the strength of the child and to the development of his powers. Sufficient variety appears in each model to prevent undue weariness or strain of muscle. Mentally, the gain has been marked in concentration of attention, in appreciation of accuracy, in independence of thought and action, in ability to study out new processes and to invent new combinations of processes already acquired. Drawing, which the sloyd has gained on this side of the ocean, has made still stronger the mental image of the model to be executed. Facts of form have been reviewed, and have acquired new life by being expressed in a new material. The

connection between sloyd and the other school studies has become more and more close.

Slow children have found expression. Cases have been observed in which children whose slow development has hampered both oral and written expression have found themselves quickly in sympathy with the more concrete problems. One such child does the most thoughtful, careful, and rapid work in his sloyd class. This has increased his courage and self-confidence so that the effect upon his other work is marked, and from being far below the average of his class he is now one of its most helpful members. Expression in action precedes expression in language. It is morally, however, that its greatest value has impressed itself. An absolute standard of truth, to which teacher as well as child appeals, in the try-square and measure, makes the value of truth more evident when it is applied to the corners of a key-tag than if simply an exercise were tested. The fact of making something which can be actually used at home or at school, something which may be an acceptable gift, is of inestimable importance in the teaching of self-respect and unselfishness, the beginning of good citizenship. A certain class of children are brought up to constantly receive gifts from parents and friends and attention and service from maids and nurses. However valuable the case may be from a social point of view, it is a training in selfishness.

To many a child, making the first sloyd model is the first useful thing he ever did,—the model is the first work his hands have ever done for any one else. The work goes on: the label is for the plant in mother's room, the key-tag is to be inscribed, "Key to the stable door, west," the fish-line winder is for brother Jack's Christmas stocking; and the child has begun to learn that it may be more blessed to give than to receive.

To teach a different moral lesson, this same making of articles of every-day, household use has as great a mission at the North End as on Beacon Street.

The little people of those wretched parts of our city where childhood is cheated of so many of its rights have no sweet home lessons of helpfulness. The street life teaches the boy to do no work if he can get a living any other way, to outwit his more fortunate neighbor, *to get something for nothing*. The model which this boy takes home from the sloyd school is the first thing he has ever done to add to the comfort of that poor place he calls home. Perhaps through his sloyd teacher comes the first suggestion that he has any duties toward it, and it is a truism that the home is the beginning of civilization.

It is not that concentration, independence, truth, self-reliance, honest judgment, fair criticism, and unselfish admiration were not the outgrowth of the former work in manual training. They were developed, but never in the same degree as in the present sloyd work with the little ones. For now the interest of the child is heartier because the exercises are within his comprehension. He can see the end of his work from the beginning: he is not only "doing," he is "making." He dons his apron with the self-confidence of one who can add to the world's measure of happiness, and he works with the double spur of love for his labor and of purpose in its disposal.

The method in the school is a class lesson upon tool or exercise.

A free-hand drawing of the object is first made, then an accurate working drawing. The child at the bench works by himself from his own drawing or from specifications which he has been taught to understand. When a difficulty appears, he must not say, "What shall I do now?" He is expected to study the drawing and his own piece so diligently that he can say, "I think this might be the next thing"; and the teacher's part is only to see that the "next thing" is done in the best possible way.

The lesson over, each child tells what he has done and characterizes his work according as his conscience approves or disapproves of the use he has made of time and thought.

Many changes have been made in the original Swedish models, and many more may have to be made. Changes are made only for sound pedagogical reasons, and after careful deliberation and consultation. Although models and class-room methods are still experimental, the principles upon which they rest find a firm support in the experience of the school whose sloyd work has been recorded.

The sloyd teaching of this school has been greatly aided by similar work done by other teachers and other schools in Boston, all of which has been made possible by certain conditions of far-seeing mind, warm heart, and generous hand.

The Normal School at Nääs was founded in 1875 by Herr Otto Salomon, to train teachers of sloyd; and it is there, of all Swedish schools, that the psychology of sloyd, as well as its methods and means of expression, have reached the most perfect development. From that school there have come to Boston five teachers, one of whom was an instructor there. All and more than these have aided in an "important and generously planned public work, undertaken in a conscientiously conservative spirit, and carried on with watchful care and with the co-operation of recognized experts." This work is the adaptation of the sloyd to the needs and conditions of American public school education.

Quoting Herr Salomon, "It is one of the fundamental requirements of sloyd that, where its principles are uniformly the same, the expression of them varies; and, therefore, the models and tools employed should also vary according to national characteristics and needs."

And further he says, "It is quite possible to employ the sloyd principles and to maintain their high educational value without the use of a single Swedish model."

Remembering these statements, proceeding cautiously and conservatively, consulting with experts and experimenting with classes, changes have been made in the models which are the expression of the principles.

When the Swedish sloyd was first presented for our study, it claimed to be based upon the same principles which form the groundwork of other educational systems of manual training, with the additional one, upon which great stress is laid, of making a useful article as the result of a simple combination of exercises. Its possible strength was evident at two points,—its moral effect and its connection with the kindergarten.

At two points the Swedish models were found lacking: they were

not based upon drawing, and they were weak upon the æsthetic side. Drawing is the first and greatest gain which has come to the sloyd by transplanting. At Nääs drawing is approved, but not insisted upon; and the Swedish models are not constructive, do not all lend themselves to drawing. As the universal language of handicraft, drawing must form the basis of all tool-work, which is its concrete expression.

Therefore, it became necessary to arrange a series of models which could be drawn and which could be constructed by the child from working drawings. At present, in all the sloyd classes, the child works from a drawing, so far as practicable from his own drawing. The better proportions and finer curves of the more recent models made here are more valuable in cultivating the æsthetic sense than are many of the Swedish models, which are less pleasing to our American eyes.

While these statements are more or less true of all of the four schools of sloyd in Boston to-day, they apply directly to that school whose methods and models have been most widely discussed. In this series of models, intended for children over eleven years of age, the exercises of the Swedish system are represented by twenty-eight models. At Nääs fifty models represent about the same number of exercises. This apparently great change in the number of models is due to certain sound reasons. The exercise which in Sweden must be many times repeated in the wood is in this American adaptation repeated in the drawing. An object of this repetition is a clear mental impression. Since this is partly gained in the drawing, it need not so frequently recur in the wood.

The better the tool, the clearer the impression it makes upon the muscular sense of its purpose and its use. Many of our American tools are superior to the Swedish, hence the American child more readily comes into sympathy with his tool. This makes less necessary upon psychological as well as physical grounds the repetition of the same physical exercise. This American adaptation provides also a series of models for children from eight to eleven years, which, while not anticipating the exercises of the second series, shall logically prepare for them. The use of drawing as a basis, and the finer tools with which the work is done, impress more clearly and readily the exercise to be taught.

Besides this gain in the mental and physical force of the child, there is another reason which allows the mental impressions to follow one another more rapidly in American teaching than in Swedish.

The kindergarten has but a slight hold in Sweden. In America, consciously or unconsciously, a large proportion of our children are under the influence of kindergarten principles and teaching. Through the gifts and occupations of the kindergarten the vision becomes keener, the hand more obedient to the will, the brain is trained through the deft hand. The connection is close in principle and method. The occupations of the kindergarten train the eye to accuracy and beauty, the hand to general dexterity. The work which the child does in kindergarten has always the intent of usefulness. The exercise of weaving is not the end in the child's mind, but the means: the woven mat is at Christmas time made into a gift for father or mother.

The sloyd appeals to the same recognized avenues to convey its impressions. Must not the child from the kindergarten be more responsive to these impressions than one who lacks this training? The drawing, the finer tools, and the greater preparation of the child consequent upon the influence of kindergarten development mark the difference between American and Swedish conditions. Hence this substitution of twenty-eight American models for fifty Swedish ones is not, as may seem at a superficial glance, a mere condensation. It has been made in order that the desired impressions shall follow each other in the order and at the intervals which are dictated by the receptivity of the child.

The sloyd, then, claims to instil a taste for and love of work in general; to inspire respect for rough, honest, bodily labor; to develop the sense and love of order, exactness, cleanliness, and economy; to cultivate perseverance and the power of concentration; to promote general dexterity; to train and develop the perceptive, analytical, constructive, and inventive faculties; to develop and strengthen the body; to cultivate the æsthetic sense; and to do all this for young children more effectively than any other educational system of manual training, because it aims to interest the pupil, adapting the exercises to his mental and physical ability by means of careful methodical progression, and producing a useful article as the result of the work.

The sloyd, with its allied drawing and its recognition of beauty of form, is the kindergarten keeping pace with the moral, mental, and physical needs as they are developed in the growth of the child; and it leads him on through the years while the brain may be trained by the hand until the brain consciously assumes the mastery, and the hand is trained by the brain.

The following paper was then read by Dr. C. J. Enebuske:—

THE RELATION OF SLOYD TO GYMNASTICS.

BY CLAES J. ENEBUSKE, A.M., PH.D.,

LECTURER AND DEMONSTRATOR OF THE LING SYSTEM AT THE BOSTON NORMAL SCHOOL OF GYMNASTICS.

I am asked to-day to speak to you upon the relation of gymnastics to sloyd. As I am not a specialist in sloyd, I deem it necessary before entering upon the task which has been assigned to me to make a few remarks that shall be explanatory of my own connection with the subject under consideration, both as a student and a teacher.

When a student at the University of Lund in Sweden, I studied several sciences, mainly the natural sciences, and endeavored to prepare myself for the profession of a high-school teacher as well as a university teacher. After having been graduated from the philosophical department, I was appointed assistant to the professor of physiological chemistry in the medical faculty. During the seven years of my stay at the university a spirited missionary work in gymnastics was carried out from the Lund University into Denmark

and Germany. The soul of this movement was Captain Carl Norlander, the director of the palestra at the university, aided by several of the professors. With a troop of students he visited several places in Denmark, practically demonstrating the work of the Swedish system. Other men, among them Dr. Ribbing, professor of practical medicine at the university, in lectures before the Pedagogical Society of Copenhagen, explained the theoretical side of the work.

In Mecklenburg, Norlander enlisted the interest of the highest authorities; and the result was a practical test of the method. The government sent commissioners to investigate the matter in Sweden, as the government of Denmark had already done.

During these years the university was frequently visited by Danish pedagogues, who studied at the anatomical institution and practised at the palestra, with the purpose of working among their countrymen after their return home. At the university the association for gymnastics and fencing took a lively interest in the movement. Of this association I was a member; and so I was brought under the direct influence of the zealous and animated interest which this movement created,—an interest made still more fervent by the ideal skirmishing provoked by the opposition of the antagonists. These antagonists were the originators of what was called the Danish system of gymnastics. Swedish gymnastics is now practically working throughout Denmark, with the sympathy of the pedagogues and the people at large.

Norlander induced me to apply the results of my scientific studies to gymnastics and to adopt it as my professional work. After having prepared myself, under his guidance, for work abroad, I decided to leave the university and go to Chili. But, changing this plan, I finally came to the United States. For four years I have labored in this country in the interest of the study of Swedish gymnastics.

From the foregoing you will see that I have derived my ideas as to the scope of pedagogical gymnastics mainly from studies among pedagogues, scientists, and medical men. Among the practical gymnasts I have acquired my practical training. The result of such study and training compels me to draw a distinction between Swedish pedagogical gymnastics and gymnastics as well as between sloyd and manual training.

The expression "manual training" is used to designate such a variety of conceptions and such a wide range of difference in practical exercises that it is impossible to compress all that the expression formerly meant into a general consideration of its relations to other branches of education. Moreover, gymnastics is frequently understood as synonymous with bodily exercise, besides being used in various more or less restricted senses. It is necessary to my purpose to place certain limitations upon the word "gymnastics."

The relation of Swedish pedagogical gymnastics to sloyd would present a fairer comparison. The names "Swedish pedagogical gymnastics" and "sloyd" suggest ideas sufficiently clearly defined to admit of an interpretation of their relation. But even these contain within their scope great manifoldness of details. By shifting the emphasis from one point to another to suit the various individualities of the different teachers and of the changing condition under which they

must apply their work, it will be seen that pedagogical gymnastics as well as sloyd are subject to modification. Within the limitation of the definition of pedagogical gymnastics different views may be entertained.

To make my position consistent, I am thus compelled to narrow down the subject under consideration to an investigation of the relation of Swedish pedagogical gymnastics, as I conceive it, and sloyd.

Let me not be misunderstood. I am not led by desire to be exclusive in my discussion of the question, neither do I disregard methods and exercises that are not identical with the scope of the Swedish gymnastics and sloyd. For my present purpose this narrowness is my choice, because it allows more distinctly defined starting-points from which to conduct our consideration, making possible more distinct results than could be obtained if attempting to labor at once with all the vast unsystematized mass of ideas included under the words "gymnastics" and "manual training."

Let us, then, first briefly outline the Swedish gymnastics as a pedagogical gymnastics, in order to form a basis upon which to consider its relation to sloyd. Gymnastic exercise is arranged with a view to developing the strength of the muscles, and promoting the efficiency of the respiratory, circulatory, and other nutritive functions of the body. But this fact does not alone entitle gymnastics to a place in the curriculum on a plane with other departments of education. Even though the brain and the nerves do share in the favorable reaction upon nutrition derived from gymnastic training, yet we are not justified for that reason in ranking gymnastics as pedagogical, any more than we are justified in calling practical dietetics, or other hygienic measures, pedagogical that certainly are indirectly helpful to education as to every kind of human labor.

When, then, does gymnastics become pedagogical? In the pregnant meaning of the word, gymnastics becomes pedagogical when the bodily movements become manifestations of the power of the mind to govern the body, to execute these movements, and to execute them in strict accord with that mental perception which is the preceding theoretical moment of any voluntary action. Viewed in this light, gymnastic movements assume an educational as well as a hygienic character: they not only aid the development of muscular tissue, but they are the means of educating faculties. The physical basis of this relation as known may be stated thus: The motor centres within the brain originate the incitation to work, which is transferred to the muscles through the nerve filaments. But back of this physical nervo-muscular mechanism sits a mental force,—the power of willing, the force of highest order of the individual, that brings the nervo-muscular machine into play. But the mechanism so described represents only the single contraction of the muscles, not the movements as a whole. It represents the degree of the contraction and its intensity: it is the force and speed of it.

The movement is the result of the simultaneous or successive contractions of several muscles working together in a certain distinct way; and the degree, force, speed, and duration of these successive muscular contractions are distinctly proportioned to one another. Over the harmonious mingling of the contractions of individual mus-

cles presides a functionary of co-ordination, of which the cerebellum and commissural fibres along certain tracts of the spinal cord are the physical basis. Degree, force, speed, and co-ordination of muscular contractions, therefore, are presided over by the human will.

Exercise gives development. This is a law of general application. It is twofold. It may be understood in the sense that exercise makes structure and exercise develops faculty. The law that exercise makes structure is of general application to all the structures that form the physical basis of the exercise. It embodies not only a building up of the structure of the bony levers, the muscles, tendons, fasciæ, and the organs upon which they depend for their nutrition : it goes farther, and embodies also the development of the structure of the nerves, the spinal cord, and the brain, that partake of the exercise, as do the former. But this building of structure is more directly a hygienic matter. Nay, even the building up of the structure of the brain itself is a hygienic affair, and only indirectly pedagogical.

The other phase of this twofold law is that exercise develops faculty. This embraces the creation of due mobility of the joints, due contractibility of the muscles, exact response between the muscles and the incitation to contraction, due conductive power of the nerve filament, and the power of the nerve-cells of the brain to originate the incitation that awakens the contraction. It embraces also the faculty of the will to govern the function of the brain centres, those meeting-points between the body and the mind. The development, the building up, of this faculty, is distinctly and directly the pedagogical aspect of gymnastics. It is the faculty of the mind through the will to govern the degree, the force, the speed, and the co-ordination of muscular contractions made manifest in the outward movements. And this is the definition of Swedish pedagogical gymnastics, as formulated by Ling, the founder and promoter of the system. Pedagogical gymnastics is the means by which man learns to put his body under the command of his own will.

The present is a narrow line dividing the two great realms, the past and the future. The experiences of the past are the proximal forces by which the race has attained its present height. The future shall be the development of the present. In the present is stored up that energy which shall unfold itself in the future.

The educator who fulfils the highest duty of his calling must be a master. He must be able to bring his pupils into intimate contact with all the accumulated experiences of the past. Thus shall be liberated the potential energy stored up within those experiences. Thus shall it be transferred into living force, by which the faculties of the pupils shall be magnified. Those faculties shall move the future. But how accomplish this? How shall the pupil be able to share the present development of the race, which represents the totality of human experience? How shall he be made ready to breast the future?

If it were possible to give to the pupil all the experience of the past, it would, indeed, be a broad education. It would include all the emotions of the human heart, all the ideas that have flashed in the human mind, all the deeds of the human body, every hope that

has stirred, every grief that has wrung, every passion that has swayed. Happily, such education is impossible. If it were possible, it would still be useless. No educator thinks it necessary or wise to try to impart to his pupils a knowledge of all the great and small facts of the universe, that crowd the history of the development of the human intellect. Time is too fleeting. Philosophers spend their lives gazing at the rainbow or searching out the new world that lies quivering in the tiniest drop. They cannot hope to accomplish everything. And the physical educator, who works under the ideas I am endeavoring to demonstrate, would not expect to put his pupil to the practice of all the movements, or all the special physical feats that have ever come under observation, or that have ever contributed to the development of the human physique.

The intellect educator makes his selection from the accumulated wealth of knowledge-facts; and in this selection he is guided by a purpose which is twofold,—to impart knowledge-facts as an object *per se*, and to exercise the mind of the pupil through the material of knowledge-facts for the purpose of educating faculties. With these objects in view, he selects different topics; and, with regard to the latter purpose of educating faculty, he must make his choice according as his aim is toward one class of faculties or another. Moreover, when his choice is made, his method must vary according as his object is to impart the knowledge gleaned by others or to educate the mind to new flights in the realms of thought, and according as he aims to put the emphasis on one faculty or another.

As the method is, so must the result be. Let me try to illustrate. Suppose three boys, twelve years of age, begin at the same time to study Latin. They have different teachers. These teachers have different methods and different ends in view. One teacher is practical. He will have his pupil in a year able to converse in the Latin tongue. The second teacher aims at practical phonetics. In a year his pupil's voice must resound with all the defiance of a Roman emperor. The third prefers to bring the mind of his pupil into contact with those disciplinary forces which lie hidden in a thorough mastery of the Roman language. A translation would make easier the comparative study; but that is denied him. Difficulties beset every step of the way. He must master them alone. He must work. He must plod. How slowly it goes! He is not led along the easy road of the least possible resistance. It is against the *optimum* of resistance that he must labor, because, as he labors, so shall he increase his strength. The road turns and curves; but it is the purpose of the teachers to direct him where he may meet continually, new and varied forms of resistance, that as many faculties may be awakened as the selected material may be appropriate to educe. He has based his method of instruction upon an analysis of the educative forces which the material offers. And now the year is gone. All three boys have succeeded. The first has read the choicest selections from the best authors. The second has sounded his voice through all the classics. The third boy, unhappy fellow, has only torn the pages of his grammar and his Nepos. But the results are different. The first repeats classical phrases with a readiness and a style that amaze. The second recites *De Bello Gallico* with

a phonetic, purer Roman than that of Cæsar. Each has acquired a sufficient touch of practical "go-aheadativeness." But the third boy, impractical, timid, can do nothing to attract the crowd. The first is a conversationalist, the second a speaker, and the third is scarcely more for the moment than a "*mutus sine liquida*." But the third boy has not stood still all this time. He has been following the exact relation of the slight flexion of word-endings into the many ideas and shades of ideas they express. Slow and tedious has been the labor; but by it his perception has been sharpened, the analytic power of his mind has been deepened, the faculty of generalization and abstraction has received an impetus, his mind has received that touch of logical consecution and causation which shall bear fruit in time to come. His mental self-activity has been disciplined and strengthened by his continuous efforts against resistance. Of course, he has stored up within his memory some knowledge-facts, he has received some phonetic experience, but they have been incidental. The emphasis of training during this year has been upon the development of his brain into a better servant, a better tool for self-activity, to give him a formal culture, a general fundamental, logical power of mind, with which to better make use of any other knowledge-material.

My object thus far has been to present my subject in such a light that I may now distinctly indicate in a few words the pedagogical aspect of Swedish gymnastics and sloyd. Both present means of formal culture along physical lines. The object of each is the general logical development of physical powers, not the development of any special technical skill. Their aim can be likened to that of the teacher of the third boy. They seek not to predispose the pupil to some specific prowess or sleight, which might develop into an outrage, not apparent, perhaps, as yet, against the boy's natural propensity. But they rather seek—if you will allow the expression—to *logically develop the fundamental and necessary faculties of the nervo-muscular intellect, that it may be ready and applicable in any direction whenever it may be called upon to act*. Thus far the aims of gymnastics and sloyd are identical.

Pedagogical gymnastics and sloyd, however, have their individualities. They differ in their range and scope, in their accessory tendencies, and in the details of their practical methods. They differ as friendly companions differ, not antagonizing, but assisting and supplementing each other. From different starting-points they converge toward the same great centre. They are parts of the same great whole. We may liken them to parts of the same grand pillar. In pedagogical gymnastics we have the deep foundation stone, the firm, solid socket, the slender, vigorous shaft: in sloyd we have the beautiful capital, surmounting and perfecting the column,—two distinct parts, each dependent upon the other; one piece of marble, with the same veins traversing all the parts. The aim of pedagogical gymnastics is toward the general fundamental physical development of the whole body. Sloyd aims to advance the general fundamental manual dexterity. By and through the general development of the whole body pedagogical gymnastics lays the foundation for that specialized skill which the life of the individual may in after years demand. Gymnastics and sloyd are alike in that the muscular work

toward physical attainment and development reacts upon the intellect and contributes toward educating moral faculties. Sloyd, in the development of general manual dexterity, lays the foundation for that specific handcraft which the future may demand. Pedagogical gymnastics and sloyd alike depend for their ultimate success upon healthy, well-developed bodies. But the teachers of gymnastics and sloyd, happier than their friends, the intellect educator and the knowledge instructor, are in a position to build up the health and develop the structures of the body by those same exercises by which they educate those faculties which constitute the ultimate aim of their labor.

The methods under which they labor, besides being educational, are also hygienic. Both are agencies in applied hygiene, although with different range of action. Pedagogical gymnastics and sloyd in common employ exercises of the body as a means of balance and variation to offset the exercise of the mind. They both need and demand the exercise of the mind as a recreation from themselves. They both have those favorable reactions upon the nutritive functions of the body which are derived from an active life in opposition to a sedentary occupation. But Swedish pedagogic gymnastics outreaches its companion in that it is at the same time and as much hygienic gymnastics. The sloyd must necessarily labor under certain limitations with reference to the hygienic aim. During the sloyd exercises the eye, the hand, the tool, and the wood upon which they work are bound by distinct though varying relations to each other, so that the relation of the different parts of the body to the whole, and of the whole body to external space, is necessarily brought under certain restrictions. In Swedish pedagogical gymnastics on the other hand, the body as a unit in its concordance with the mind is the sole premise, and all externalia are made to conform to its interests. This system of gymnastics includes within itself and embraces an elaborate, active, hygienic program. It constitutes a scientifically planned, aggressive biological treatment, tending toward the perfection of the organic health and harmony of the individual.

Carrying with him the influence and effects of such pedagogical and biological forces, the pupil is given to the sloyd teacher. It is his duty to add to the general bodily attainment a farther-reaching, more fully developed manual dexterity. The work of the sloyd teacher is not to tear down, but to build up. It is not remodelling, but a completing of the grand structure of a perfect manhood. It is his duty not to counteract, but to consolidate and focalize, the results of the biological treatment of the pedagogical gymnastics.

I have endeavored to outline in a very condensed and restricted form the aim and scope of Swedish pedagogical gymnastics and sloyd and their relations to each other. I realize that it is an impossibility to convey in such a fragmentary way anything like a true picture of the grand aim and possibility of these systems. A full appreciation of their importance and capabilities is only obtained through attentive and arduous study, but it is a study that will repay the student. I fear that to those who have received no direct and detailed information about pedagogical gymnastics and sloyd what I have said may sound vague, like an ideal circle drawn about the wishes and wants of the day. But let me say it is a palpable reality. The program at

which I have hinted is the exact result of the deductions of those who have given the subject of Swedish pedagogical gymnastics and sloyd their honest and conscientious study. The practical methods represented by these two names strive to be, and indeed are, but the practical adaptation of those ideas.

I shall endeavor to further explain somewhat the scope of both systems, and their distinction from other forms of exercises under the names of gymnastics and manual training.

The exercises which must be practised for the purpose of general bodily development in pedagogical gymnastics, are selected only after a careful analysis of their mechanism. By this analysis is ascertained what the exercise in the movement in reality is. By it are ascertained what physical faculties are involved in its execution. Only by such analysis can be determined the value a movement possesses with reference to the gymnastic purpose and its position in the ascending scale of increasing difficulty. The external form of the movement does not express directly its gymnastic rank. We may be easily deceived. A movement that appears swift, difficult, or extended may in fact be trifling in execution, and involve but small expenditure of force; while, on the contrary, a movement which to the eye appears easy as the static moment of the movement may in truth involve great difficulties and perhaps demand an outlay of great strength.

The movements which we see are the external manifestations of internal movements which we do not see, and of forces that we have the faculty to govern. Certain movements are always the symbols of certain faculties and of certain reactions upon the bodily system. Under the direction of a teacher these movements may be made the means of touching certain faculties of the pupil, and bringing them into contact with appropriate resistance. By their struggle against this resistance the strength of these faculties is enhanced, while at the same time they are made the means of producing certain physiological effects in the system of the pupil.

Ling, the founder of the system, based his selection and classification of gymnastic movements upon an analysis of their physiological components. All movements, whatever may be their character, are limited by the structure of the joints and the arrangement of the ligaments. Their study ascertains the direction in which the bony levers of the body may be moved in relation to each other and also to what extent the movement may be carried.

To be complete, a system of pedagogical gymnastics must provide for the exercise of all the joints of the body through the different movements of which they are capable, each movement carried to its full extent. Only a very limited number of movements are necessary to accomplish this. But a system based upon the structure of the joints alone could be scarcely more than a joint gymnastics.

The muscles are the instruments by which the joints are moved. Their study ascertains, as may be anticipated, that the arrangement of them exactly corresponds to the formation of the joints. Each joint of the body has accompanying it a set of muscles that shall produce all the varied motions of which the joint is capable. It follows, then, that exercise of the joints through all the motions of which

they are capable must call into exercise, and so develop, those accompanying muscles which are the instruments for these motions.

The muscles, therefore, may be fully exercised, as regards degree and intensity of action, by as limited a number of movements as taken together shall form a complete joint gymnastics.

Such a joint and muscle gymnastics, however, would not be a complete gymnastics. For it is not sufficient. It is necessary and indispensable to a complete system of gymnastics, not only that it should present means for the control of the elementary motions of single joints, but that it should also present the means of developing the co-ordination of those elementary motions that go to make up the compound movements. And, of the vast number of compound movements that are possible, such are selected which are essential and necessary for fundamental bodily dexterity. Among those we count such movements, with regard to the purposes of man, as are necessary *per se* and such as are necessary as constituents of other movements that belong to those necessary *per se*.

For instance, locomotion and prehension are necessary *per se*, and the movements by which the variations of locomotion and prehension are brought about become necessary by them. In order to give decided direction and intensity to an outward aimed force with the upper extremity, it is necessary to select that position which shall give a base for the feet, that best steadies the force, and to bring the trunk in such position as offers the firmest and most distinct fulcrum for the shoulder. The variations of this physical problem that meets everybody throughout the day necessitate manifold variations of the position of the trunk upon the thighs, different combinations of the twist and bend of the back, modifications of the position of the thorax. These modify the mechanism of breathing, and modify the conditions of the heart. It would be interesting to follow out in detail, but time does not admit. The movements thus necessary to practise in the pedagogical gymnastics are selected after subjecting all movements recorded or observed to an analytical criticism. We dissect their physiological components, so as to ascertain what exercise is involved in them. We eliminate from the vast number those which are alike and common, and retain those which are characteristic and peculiar. In this way, the vast mass of possible movements is reduced to a more limited number of types, which together represent all the physical faculties of man so far as they belong to the realm of bodily dexterity of a general application. Those types together represent the essential components of all forms of bodily activity.

The movements which we practise in the pedagogical gymnastics, however, are not reduced in this way to the smallest possible number. It is necessary only that none of the essential types which I have described be forgotten. Some or all of these types are practised in several variations, so as to give sufficient variety to the work, but not alone for the sake of variety. Different variations may be capable of producing different action upon the nutritive functions. And consequently such variations must be chosen as can produce those effects which are desirable with reference to the hygienic purpose of gymnastics.

The force and speed of the muscular contractions are developed by

varying the amount of resistance against the contraction, and by varying its speed. There is a certain range of speed of contraction possessed by the untrained muscle. This may be widened by the practice of movements that represent the lowest as well as the highest speed, and so extend the lowest limit of speed still lower and the highest limit of it to a still higher degree.

Similarly there is also a certain amount of strength possessed by the untrained muscle. This may be increased to a certain extent by allowing the muscle to contract under a gradually increased resistance. It is not alone the muscles interested in the locomotion and prehension that may in this way be strengthened, but the muscles that are instrumental in the respiratory act—nay, even the heart—may be submitted to contractions under various degrees of resistance by varying the positions of the body.

The means by which the co-ordinative power is increased is by multiplying the complexity of the movement. The increased complexity represents the increase of resistance by which the co-ordinative power adapts itself to match greater difficulties.

By the preceding I hope to have sufficiently indicated what I mean by general bodily dexterity as contrary to specific bodily skill. If you submit a boy to physical training planned to make him as swift a runner as possible, or a jumper or boxer or parallel bar performer or Indian club juggler or anything of the kind, your work is in the interest of some specific bodily skill. Such specific skill has not the same general application as the attainment of the pedagogical gymnastics. Nay, even it may prove adverse to the interest of the general bodily development, structural as well as facultative, because it throws the physical energies into certain directions with concentrated force; and this is done by depriving other sides of the physique from attention in a corresponding measure. Methods that lead to the highest possible specific skill are not identical with those which give the logical development of all essential faculties.

If you want a boy to be as skilled as possible in one special feat, your best plan is to try to find out in what line he is most gifted, find his road of least resistance, and lead him to be developed along that line. Where nature has already thrown the gates wide open to him, there he may be expected to go the farthest.

If, on the contrary, you aim at the logical development of his general bodily attainments, then you would better ascertain where his weakest points are, where lies his road of greatest natural resistance, greatest difficulty; and along that you must guide him by grading and modifying the difficulties, so that by his own efforts he may be able to overcome the resistance, thus to develop his smallest faculties up to a par with the strongest, or as far in that direction as is attainable.

In the sloyd the development of general manual dexterity is carried out upon the same principles.

The man whose history is also the history of the sloyd, Otto Salomon, of Sweden, has been laboring for the last fifteen years to develop what is known under the name of the Nääs system. Somewhat earlier than that he began to take an interest in manual training. But the manual training during that earlier period of his activ-

ity was understood to be somewhat different from the present sloyd. It was then a movement led by national economical interest. It was directed toward the elevation and extension of domestic industry. When first it was planned to carry out the program in the schools, the movement began to be turned in its present direction. The schoolmen objected to the use of the schools as a direct means for national economic purposes. They asserted the position of the school as an institution for general culture; and, if sloyd were to have a place in the school curriculum, they demanded that it must be as a means of general culture. Probably Salomon had conceived the significance of manual labor as a means of formal culture earlier, but it is generally stated that the year 1877 is the birth year of pedagogical sloyd. In this year Salomon travelled in Finland. He met there Cygnaeus, the great pedagogue and creator of the Finnish Folk School. From their exchange of ideas, it is said, Salomon became decidedly confirmed in the idea of pedagogical sloyd as something other and different from an industrial manual training. From that time he has been engaged in the work that has resulted in the present Nääs method, and he continues to labor for its further development.

The aim as well as the method is different in technical manual training and in pedagogical sloyd. In developing specific manual skill for technical purposes, it is to the advantage of the pupil to ascertain for which special kind of labor he possesses naturally the greatest aptitude, to find where lies his road of least possible resistance. Along that road he ought to proceed, because there is his best chance to go the farthest. Laboring in this direction only, he may be expected to produce the greatest amount of work, which, from an economical standpoint, is most advantageous. In this kind of training, the object is by the labor to produce work.

In sloyd, on the contrary, the aim is by the labor to educe the faculties of man. The method that may prove the best in the first instance may perhaps be the least effective in the last.

If the educing of the faculties be the object, the method may not be based upon the external form of the movements of the hand, nor upon the size and complication of the tools, nor upon the quality of the material in which the work is done. Laboring with such aim, it also must be considered illegitimate to apply the work only in the line of the most pronounced ability, as this would leave the less pronounced faculties undeveloped. The method must be based as in pedagogical gymnastics upon an analysis of the work, so as to ascertain what is the exercise in the work. And such material must be selected as will offer the greatest possible variety and completeness of exercise. But there is not, as in gymnastics, an analysis of the physiological components of the movements.

For reasons that do not fall within my present purpose to illustrate, Salomon prefers wood-work as material for the exercises. It offers the greatest variety and completeness of exercise without involving any of the disadvantages that to a greater or less extent are connected with other kinds of labor.

Salomon's proceeding in elaborating the system has been about as follows. All kinds of wood-work have been subjected to analytic

criticism, in order to ascertain the exercises which are embraced by them. In this way, he has been able, to a great extent, to eliminate the like and common and retain the peculiar and characteristic, and so to reduce the large manifoldness of work of this kind to a comparatively limited number of types, representing certain exercises. Upon these types have been made variations, so as to provide for a sufficient review of the exercises and to give the variety to the work that is deemed desirable. These types, moreover, are classified and arranged according to complication and difficulty in an ascending scale from the easiest to the most difficult.

These types, or models, form, consequently, classes of progressive series, just as do the movements of the pedagogical gymnastics. Each preceding model of sloyd, as each preceding movement of pedagogical gymnastics, is a component of the following, and is intended to educe the faculty that shall be applied as auxiliary in the following. We can compare these arrangements with the succession of exercises, for instance, in mathematics. You drill the boy in addition before beginning with subtraction, in subtraction before multiplication, multiplication before division, and all four before the rule of three. Your reason is evident. In gymnastics and manual training the reason for the progression is not so easy for any one to see, but the reason is none the less compulsory. The logical succession of exercises gives the best and most certain results.

In the pedagogical gymnastic drill the form of the movement is first placed before the eye of the pupil in a model, thereafter he has to memorize the model, and after a word of command that suggests it he brings his own body through a series of positions that faithfully copy his perception of the movement. The precision of the movement is also a test of the exactness of the perception and the perfection of the harmony between the mental perception and the action of the muscles.

In the sloyd exercise the pupil forms by means of the tool out of the wood a copy of the model before his eye, or in a more advanced stage he forms it after a drawing. In both instances the correctness is, as Salomon expresses it, a receipt of exact comprehension of the model and also a receipt of perfect harmony between the mind, eye, and acting forces of the hand.

In both pedagogical gymnastics and sloyd we train, besides the physical powers, the intensity and exactness of mental perception and cultivate the power of attention. By both pedagogical gymnastics and sloyd we establish a quick communication, a mutual acquaintance, a ready response, between the grand-central station of the brain and the periferic depots, distributed all over the body. This forms the basis of the power of self-activity, which is the foundation for the love of work. Both the gymnastic movements and sloyd models present for perception and action symmetric and harmonious forms, and by them we awaken the sense of beauty,—the æsthetic sense.

By training the power and ease of doing both pedagogical gymnastics and sloyd, we introduce the pupil into the pleasure of work. And so we have opportunity to awaken and magnify those forms of moral bent which we call love of activity, industry, perseverance, love of exactness and order, and habits of attention.

Surpassing its companion in one direction, the sloyd offers chances to develop inventive power and constructive faculty. On the other hand, the pedagogical gymnastics outstrip sloyd in their capacity for educating courage, self-control, self-reliance. Pedagogical gymnastics surpasses sloyd still farther in its capacity of being a hygienic gymnastics, as has already been suggested. Gymnastics gives not only healthy bodies and symmetrical development, but also, as compared with sloyd, gives rational hygienic working positions,—positions in which the force can be utilized to the greatest advantage, and health and symmetric growth guarded.

Both pedagogical gymnastics and sloyd represent means toward a general all-around culture as something different from specialized training for one-sided skill. They have both chosen as their ideal "*magnus in uno, magnus in omnibus*." They demand that the specialized skill necessary for a practical vocation in life shall be based upon and derived from a general fundamental culture, which it is the duty of the school to provide.

Any exclusively specialized, one-sided skill makes the man dependent upon external conjectures and chances, whereas a skill based upon and derived from a broad and thorough general culture makes the man truly independent. Such a culture enables him to make his own conjectures, his own chances. The former is like the mountain river, which depends upon the slope of the hillsides for finding its way to the lake in the direction of the least resistance, whereas the latter is like the Gulf Stream, which with accumulated strength forces its own billows through the ocean.

The following address was made by Dr. Felix Adler :—

THE EDUCATIONAL VALUE OF MANUAL TRAINING IN THE PUBLIC SCHOOLS.

BY DR. FELIX ADLER.

[Phonographically reported.]

It has been remarked that manual training is in the experimental stage. This is true; but the experiment is much farther advanced than some who have spoken on the subject seem to realize. It is a singular fact that in most of the public schools of this country the history of the United States only is taught, as if the other nations of the world were not worthy of the attention of young American citizens. I speak of the grammar schools. In view of the fact that so many of our pupils never reach the high schools, it is remarkable that the history of other countries should be neglected. Therefore, it is not surprising that the average citizen should regard important questions as they arise from a mere local point of view. Manual training has a history in other countries outside the United States; and, if we consult the French experiment, we shall be impressed by the degree of success which has already been achieved in that country. The very fact that manual training is being rapidly introduced into

many of the French public schools is a remarkable testimony in its favor, because the system there is not guided after the haphazard fashion of this country, where every town has its own Board of Education and where those boards are not usually composed of experts. The educational system of France is governed by a national council, consisting of some of the most eminent men of science to be found in that country. Every step that is taken is carefully and fully considered, every trifling innovation is the subject of earnest investigation. If, therefore, manual training has met with remarkable success in France, that is testimony in its favor which should not be ignored. The report prepared by Mr. Schoenhof of technical education in France gives all the information that one might desire upon this subject.

Again, in Germany the work has been growing during the past ten years. There are the schools of Leipzig, of Dresden, of Berlin, and in South Germany at Weinheim, Heidelberg, and other places, in which manual training for young children has been carried on with remarkable success.

I am sorry to say there is no report in the English language of the work accomplished in manual training in Germany. There has been recently published a very valuable report by Mr. Kehr, giving the history of the attempts to introduce manual training in the public schools of Germany; and those familiar with the German language will find this work a source of valuable information.

Even in the United States the work done is no longer in the first stages of experiment; and I wish to-day to allude to a few points and a few facts which, judging from my own experience, seem to me fairly well established. I find on consulting Professor Kehr's book that among those who have given the most thoughtful attention to the subject the following points are accepted, namely: that manual training means the training of the intellect as well as of the hand; that its chief recommendation is that it offers a new instrumentality for training the mind; that manual training logically connects with the system of teaching at the point called object teaching; that the business of manual training is to deepen the methods of object teaching; that whereas Pestalozzi and his followers, the object teachers, make it their aim and purpose to introduce the child to the objects of nature by bringing it into direct contact with these objects and giving it the thing to observe instead of merely the name to hear, manual training proceeds a step further and facilitates a knowledge of the properties of things by causing the pupils to *make* those things. The old object method was to teach the child to observe, which is better than to teach the names of things; but manual training teaches them not only to observe, but to create. And that is an entirely new point of view, a new principle of selection for the manual training lessons. We are to remember that the chief purpose of the training in the workshop in the school is to deepen the acquaintance of the pupils with objects; lastly, that the principal departments of the school in which this method that I have just alluded to is illustrated are the departments of drawing, of geometry, and of science. It gives the pupil a better knowledge of things if he not only sees the form, if he not only reproduces it in the drawing,—that is, on the

flat,—but if he reproduces it as an object. The pupil receives a clearer idea of primary geometric conceptions if he not only sees and handles the sphere and the cylinder and the cube and the prism, but if he also makes these objects for the sake of knowing about them. That is the point of view upon which German educators seem to be agreed.

I may say that in our own work, which began in 1880, several years before the German and French movements started, we have developed the same principles independently, without any knowledge of what was going on across the ocean. It has always seemed to us that the point to be kept in view was that manual training is an advance upon Pestalozzi's method of object teaching.

I have promised Mr. Seaver to give my attention this morning chiefly to the relation of manual training to the moral instruction and the moral strengthening of the pupil. I believe that the work done in the shop makes the will strong, stronger than it would otherwise be. I believe that shop-work is specially important to young criminals. This has been proved. It has been found to be the means of giving moral habits to those unfortunate boys and girls whom the State is compelled to take care of in special institutions, such as reformatories and the like. If it produces such excellent results even with poor material, how much better would be the effect on the ordinary boy or girl, brought up in a virtuous home and in moral surroundings!

But, we ask, how does the work done in the shop act upon the character? What is the difference between desire and will? The desire is a psychic reaction which occurs when the image of an object rises in our mind connected with a notion of anticipated possession. A prisoner in Siberia thinks of home and of his friends at a distance. The images of these friends rise before his mind, and there comes, at the same time, an intense yearning and going out of his nature toward them. These images are connected with the notion of reunion, of a return to these friends. We say that the Siberian prisoner has experienced a desire to return home. Desires alone pass over the mind like clouds over a lowly valley, unless they are supplemented by other force. If now this prisoner is so far influenced by his interest in and desire to see his friends as to form a plot with his fellow-prisoners and to dig under the walls of his prison and to try to escape, we say that he is performing an act of the will. In other words, we may define the faculty of the will as that faculty which adopts means to ends.

Now, the object of moral teaching is to strengthen the will in the pupil. It is also necessary, of course, to make the will good. I will speak of that later. The first aim should be to make the will strong. The best intentions are of no avail unless the will is strong to carry them out. If the will is the faculty which adopts means to ends, then whatever does enlighten the thought and strengthen the will must give to the pupil the following opportunities and advantages.

In the first place, it is necessary that he should have an initial interest in the end proposed. If the Siberian prisoner has no interest in his friends, he will never adopt means to ends, in order to reach them. There must be an interest connected with the end proposed: that is the first condition.

In the second place, the person whose character we wish to strengthen must have the power of performing or adopting a long series of means to reach certain ends, because every great end that is to be accomplished requires a prolonged series of means which lead up to it; and the will is proportionately great in proportion to the length of the series of efforts through which the man or boy is capable of progressing toward the aim. That will, other things being equal, is the strongest which is capable of sustained effort. For what does sustained effort mean? The power of following a prolonged series of means, one means leading up to another and on to another, until the end is reached.

Lastly, the strength of will is characterized by the power to follow not only a prolonged, but a complicated series of means which lead to the end in view.

Now, to make my application. There are plenty of boys, and girls too,—but let me speak of boys for brevity's sake,—who do not learn, who do not acquire, the habit of sustained effort in school, for the simple reason that they take no interest in the end proposed, be it the mastery of arithmetic or the study of geography or of reading or spelling. They do not take to it: therefore, their will is not aroused in the first instance. To rouse the will, the boy must have a strong interest in the thing proposed. There are very few boys, indeed, who are not at once alert and interested if the thing proposed be the making of a wooden box, to handle tools, or to produce some fine result in the shop, whatever it may be. And it is just that class of boys who have no natural interest in the ordinary subjects of education and the ordinary subjects of the school curriculum who are most strongly appealed to by the sort of work that is offered to them in the shop. The shop-work therefore rouses an interest in the end proposed.

The other points are self-evident. It also helps pupils to acquire the power of sustained effort; that is, the keeping of the end in view and going through the prolonged series of means which lead to it. It is a great help to this unimaginative class of children that the object for which they labor is physically in view. The box is in the process of making for weeks: the object upon which they toil is kept steadily before their eyes. They cannot become distracted, and allow their fancy to wander; for the object is right before them. They must buckle their will down to it. The series of means is prolonged and complicated. When the box is complete, the pupil is rewarded by his success and enjoys a sense of achievement. Thus an interest is awakened, and he enters upon similar efforts and is able to go through a prolonged and complicated series, because his first effort was crowned with success. It is in this way that we conceive of the work of the shops as an admirable means for strengthening the will, as has been practically proved in our reformatories. My object is to suggest a psychological theory to explain the practical results that have been achieved.

As for influencing the will toward virtuous impulses, we can rely upon the usual means resorted to in all good schools for that purpose. The will is made good as well as strong by the example of the teacher, by giving the pupil an opportunity to perform acts of kindness and generosity, by bringing this moral faculty into exercise and

by means of biographies, which should be taught in every good public school. Selected biographies should have almost as great an effect as a present example upon the pupil's mind.

The difficulty in many cases, however, is not that the intention is wrong, that the child does not desire to be good or do what is right, but that the child is weak, his will is too feeble to carry out his good purposes. I have examined not a few of the pupils of our reformatories and of those who belong to the criminal or semi-criminal class, and I have been struck by the good nature of so many. They are really kindly, affectionate, demonstrative. One would suppose them to be good children, and yet some of these good children have committed the most serious crimes. They go astray because, though the intention is good, the will is vacillating. They have not the power of remaining true to a high aim: this the training of the shop and the school must aim to develop and fasten in them.

There are other moral considerations which I must not leave wholly out of sight. Mr. Leslie Stephen, in a recent article, has said that in the ideal society individuality will be strengthened, and the greatest variety of tastes, talents, and pursuits, will be encouraged. Now, I believe that it is one of the great functions of the school to help the pupil discover his true individuality. I think one of the great reasons why so many people fail in life is because they were apple-trees, and their teachers trained them as if they were peach-trees. And the mischief is that many of us do not know whether we are apple-trees or peach-trees. It is not easy to discover one's own bent, one's own true direction. While I do not claim that this new method of manual training is going to do everything, that it is the solvent for all our ills, yet it can contribute much in this direction. In order to enable us to discover the bent of the pupil, we need as many educational facilities as possible. We need to supply a sufficient number of outlets for different tastes, to find out different ways to help our pupils, at least to find out what they are good for and what nature intended them to be.

And here I may mention a result of my own observation in the school with which I am connected. This fact has been repeated so often that I have not the least hesitation in considering it an absolute fact. Pupils can be broadly divided into literate and non-literate. We have, of course, pupils on the borders of each; but this broad distinction will hold. We have some pupils who are easily first in reading, in arithmetic, in the common branches, who write essays, who take pleasure in reading poetry, and so forth. Then there is a large number of those who have not the least literary talent. They are very poor readers. In language, even at twelve or thirteen, they lag behind the primary scholars. Their essays are a nightmare. In arithmetic, also, they are deficient. Now remember that these children in the old-fashioned public school would be graded according to their success in just those branches; and, if found deficient in these departments, they would be regarded as dunces, and would be led so to consider themselves. We find that the shop is the salvation of such pupils. It is an almost invariable experience that just those very boys who are most deficient in the common branches are leaders of their class, easily first, in the shop-work, in natural history and

modelling. The boy who is a poor reader, whose essays are wretched, models the finest heads in the art-room, and receives the highest credits from his teacher in the shop, and is ready to answer questions in natural history. By opening these new opportunities we save the intellectual life of these pupils. Having achieved success in one direction, and feeling that the class looks up to them and the teacher praises them, instead of always being humiliated as the dunces of the class, they gain courage and confidence, and make more successful attempts in other work. I do not say that they will ever excel in the literary branches. I believe that literary qualification is as much a natural talent as the musical gift or the faculty of writing fine poetry. Such boys cannot excel in literature, but they will do fairly well; and, what is most important, their self-respect will be preserved.

These methods of employing modelling-work, and of laying new emphasis upon natural science teaching, are all not only so many means of developing what is called the all-round manhood and womanhood of the pupil, but they also give us the opportunity of testing in what direction the special fitness of the boy or girl lies.

Of course we can ride our hobbies too far. Harmonious culture is an excellent thing as an ideal, but do not let us deceive ourselves: it is an ideal only. If it leads us to neglect special fitnesses on the part of our pupils, it will lead us into a grand mistake. Like every new idea, it is apt to be overdone. You cannot give these boys who are fitted for manual work, who are destined by nature to be mechanics or engineers, the same literary training that you would give to your born poet or writer. The main object is not to neglect that side of their nature, but to try to cultivate it as far as possible. The deeper culture will be laid in the direction of specialties. No man can be generally cultured till he has received special culture. I believe that any one who begins at the surface of a sphere and digs down far enough will get to the centre. Knowledge is a sphere, and from the centre one can command the whole sphere; while he who remains on the surface, covering, or trying to cover, all the domains of knowledge, with his falsely called general culture, will never be deep. Take one specialty and go deep enough, and you will get the best general culture it is possible to achieve. I regard this new opportunity for manual training, among the rest, as a means of discovering the special fitness of the pupil, because the character of the pupil develops best in the sunlight, because a man or woman is always likelier to be morally strong if he or she has found the right sphere of activity. Therefore, this discovery of individual fitness is a great help to the building up of character.

There are a few obvious points that may be referred to. The atmosphere of the shop is conducive to morality. It helps all the other departments of the school for this reason: that in the shop the teacher takes the right attitude toward the pupil and the pupil toward the teacher. The right attitude is that the pupil should look to the teacher as a person who is to guide him, as one who has preceded him in the path of knowledge, who can do things better than he can. The right attitude is taken by the pupil when he looks upon the teacher as his friend who gives him help which he desires to re-

ceive. That is not often the case in the ordinary school. As a rule, in the ordinary methods, the pupil who studies a grammar lesson is not deeply desirous to be informed upon the subject of grammar. He does not welcome the help which the teacher gives as a boon, nor is it true in many other branches. The pupil often looks on his task as a burden, and he submits to it because he must.

In the workshop it is different. The boy wants to make the box. The teacher knows how to make it, and the boy is grateful to the teacher for his help.

The shop also cultivates the spirit of co-operation among the pupils. We have made it part of our programme that the class as a class shall do certain work, each pupil contributing a part, the teacher selecting them according to ability. Thus working in common, the whole class occupied with one object, there results a brotherly feeling, a sense of pride in common work, and a cultivation of the co-operative spirit, which in later life can be utilized to the highest ends of character-building.

Mr. Albert G. Boyden, Principal of the State Normal School at Bridgewater, Mass., had prepared remarks which for want of time were omitted, but which at the editor's request have been furnished for publication here.

MR. BOYDEN.—*What is manual training?* All training implies mental activity. Every movement of the hand is determined by an act of will, which implies a feeling that moves the will; and the feeling implies a knowledge of some objects. The mental activity may be small in degree when the manual effort has been many times repeated; but it must be there to guide, or one cannot say, *I* performed the act. The mind perceives more qualities through the hand than through any other one sense; and it uses the hand to present the external object to the other senses, so that it can perceive through them other qualities. We express ideas by speech, writing, drawing, moulding, and painting. All these modes of expression except the first require the use of the hand with the other senses. In all the shaping of matter into useful and beautiful forms, the hand, aided by the other senses, is the instrument of the mind in the use of tools and in the control of the machinery employed. It is the mind which uses the hand. It is the mind which must be trained to the performance of any work. The difference between the skilled and the unskilled manual laborer is the greater mental power which the skilled workman is able to use. Manual training is the training of the mind to use the hand in connection with the other senses, in the acquisition of ideas from objects, in the expression of the ideas acquired, and in shaping matter into useful and beautiful forms.

What is the place of manual training in educational work?

First, What place does it hold in the acquisition of ideas? The learner must handle the objects whose qualities he perceives through the senses. "Please not handle," has to be placed on very choice collection of goods, to repress the natural impulse to handle the object which one desires to observe.

He must handle the objects whose *colors* he would know, place them together to form pleasing combinations of colors, and mix and apply the colors with his own hands.

He must handle the bodies whose *form* he would know, measure their dimensions, draw the forms, and make them of clay, paper, or wood.

He must handle the minerals to find their physical and chemical properties.

He must handle the plant to observe its parts, to find its structure and uses, and must draw the plant and its parts to fix in his mind their forms.

He must handle the animal to observe its parts, dissect it to learn its structure, and draw it to fix its form in his mind.

He must handle the counters to learn the facts of numbers ; must himself divide the unit into equal parts ; must use the linear unit in measuring lengths, the units of surface in measuring surfaces, the cubical units in measuring solids, the liquid units in measuring liquids, dry units in measuring grains, and units of weight in weighing substances. He must measure the dimensions of the surfaces and volumes whose area and contents he would compute.

He must perform the experiments to learn the action of the forces which produce the physical and chemical changes in solids, liquids, and gases, and record his observations and inferences.

He must mould and draw geographical objects, use the globe, and map the earth's surface in the study of geography.

He must write the expressions whose construction and use he would study in grammar, rhetoric, and the languages.

He must prepare outlines, charts, tables, and write papers in the study of history and civil government.

He must express in writing what he observes and thinks in all his studies.

It appears from this analysis of the school work that in the acquisition of knowledge, throughout the entire course of school studies, there is constant occasion to train the mind to use the hand in connection with the other senses, in the study of objects and subjects, in performing experiments and in recording results.

Second, What is the place of manual training in the expression of ideas? In writing, drawing, moulding, painting, the hand is in constant use with the other senses. Some one or more of these manual modes of expression are in use every day in every well-conducted school.

Third, What is the place of manual training in shaping matter into useful and beautiful forms by the use of tools in the public schools?

We have seen that, in the acquisition and use of definite knowledge, the learner must study objects, and make, as far as possible, the forms, the units of measure, the simple apparatus which he uses. He must therefore be supplied or supply himself with specimens, minerals, plants, and animals ; with some clay, card-board, boards, laths, nails, screws, and sand-paper ; some sheet lead, tin, zinc, iron, and copper wire ; some common substances, a few chemicals, rubber tubing, glass tubing, test-tubes, small bottles, and tin cans.

The shaping of this material by the learner into the forms and simple apparatus he must use for illustrations and experiments requires the use of some common tools,—the scissors, knife, hammer, hatchet, plane, square, saw, chisel, bit, and file,—the tools which are

found necessary in every well-regulated family. In the high school the turning lathe, with the jig-saw and circular-saw attachment, is a valuable addition.

There should be a place in every school-room for keeping the minerals, plants, animals, substances, and apparatus required in teaching; and the use of tools in making apparatus will require a simple work-bench in a place suitable for the work.

This training of the mind to use the hand with the other senses in the study of objects—in observing, experimenting, inferring, and recording; in writing, drawing, moulding, painting; in making simple apparatus necessary for illustrations and experiments, and the use of knowledge—is the kind of manual training which is necessary, practicable, and profitable in the public school.

When manual training is extended to the carpenter's, the wood-turning, the founding, forging, and machine-tool laboratories, we have passed beyond the public school into the technological school, which is for the *special* training of those who are to perform or direct skilled mechanical labor in the trades.

The work of the school in many instances has been simply the getting and reciting lessons from the text-book. Often it has been mere task-work with little meaning to the child, and not unfrequently resulting in a feeling of dislike for the school. The revolt against this stultifying process has brought manual training, in the use of elementary tools, into prominence as a corrective for this evil in the school. Manual training is an essential element in education; but it is not and never can be "the philosopher's stone in education," nor the incarnation of the dream of the alchemist.

Every child is a body and mind which must be active either in up-building or degrading himself. The public school is for the "all-around" training of the child, and is to secure to him, so far as it has the control of his education, the power to observe through all his senses, power to remember and imagine, to think, power of expression, elementary and scientific knowledge, right motives to action, will power, and the supremacy of conscience. The ends to be sought through all training are mental power, knowledge, and good character.

Third Session.

Thursday Afternoon, April 9.

The Conference was called to order at 3 P.M. by President Walker. The following paper was read by Professor E. J. James of the University of Pennsylvania :—

THE KINDERGARTEN AND THE PUBLIC SCHOOL.

BY PROFESSOR EDMUND J. JAMES.

It may seem somewhat presumptuous on my part to undertake to discuss, however briefly, in the presence of such an audience as this, the nature and functions of the kindergarten. There are many here before me who are so much better acquainted, both theoretically and practically, with the proper sphere and workings of this institution so recently introduced into our midst that I, of course, cannot think of attempting to contribute anything to their knowledge of this subject, and shall count myself happy if I succeed in presenting the points to which I have given some little attention without betraying too gross an ignorance of that portion of the subject with which they are most familiar.

I can lay no claim to an expert's knowledge either of the principles or the art of the kindergarten teacher. Indeed, I must admit that I stand a little in awe of the profound philosophy which many writers on the kindergarten lay at the basis of their practical methods; and I might as well confess at the start that almost any young graduate of a kindergarten training school can put me to shame with her superior knowledge of mental philosophy, child-mind, etc.

I may, however, lay some claim to having given a pretty careful study to educational systems as a whole, both in this country and in Europe. It is a part of my duty as professor of public administration in the University of Pennsylvania to examine and discuss the functions of government,—to set forth the extent to which society uses the machinery of government to attain its ends. In this work I am called upon not merely to describe what functions the State actually undertakes and the manner in which it carries them out, but also to investigate the basis for such a policy, and to set forth as far as possible the reasons for and against it. Education forms, of course, one of the most important, and nowadays one of the most comprehensive, branches of public administration. I have, therefore, naturally become deeply interested in educational policy as one of the leading departments of State activity, and in all the different branches of education which go to make up a comprehensive system of public instruction and training. It was from this aspect of the case that I

became interested in kindergarten work, and it is from this point of view that I shall present the subject to-day ; namely, the kindergarten as an integral and essential part of a broad scheme of public education.

At the same time, in order to set forth clearly and satisfactorily the thoughts which underlie this paper, it seems to me necessary to preface my argument with a brief consideration of the basis and province of the kindergarten.

The average child in our society comes in conscious contact during the first six to ten years of his life with four great institutions,—the family, the school, the Church, and the State. They all share in educating him, both directly and indirectly, for life in human society. The peculiar share which each of these institutions takes in the education of the child is a varying one, changing with time, place, and circumstance. As a matter of fact, it has been determined thus far in human history to a large extent unconsciously, oftentimes seemingly by accident. To a certain extent, indeed, this is true, not only of the distribution of the work of education, but also of all national effort in behalf of education itself. But with every step in human civilization we have come nearer and nearer to the time when public attention shall be more and more concentrated on what is beyond all doubt the most important question in any given generation,—namely, that of the education of the next,—and the time when the conviction shall be forced home upon the public consciousness with an absolutely irresistible force that all that has been done in education is but the merest beginning, and that we must open our minds and hearts and purses in earnest in the support of this cause if we would look forward to the future of our race with reasonable hope and complacency. There are, fortunately for us, many signs of a deep and general awakening on this important subject, not only in our own midst, but across the seas both east and west, in Asia as well as in Europe. Within the last fifteen years a system of popular schools, looking towards bringing the opportunities for a school education within the reach of every child in the community, has finally been established in the southern half of our own country, in England, in France, in Italy, and in other European countries, and in Japan and India. Those who, twenty years ago, would have prophesied that these things would come to pass within this century, would have been derided and ridiculed as little short of lunatics. Who would dare prophesy what the next fifteen years will accomplish in this direction?

I think sometimes that we make a mistake in not setting our standard of achievement high enough. We do not hitch our wagon to a star. It is well now and then to take stock of what has been accomplished thus far,—not with any idea that we shall become satisfied with work accomplished, but to give us new courage to go on with our work, seeing from the past how the impossible becomes, first, the possible, and then the actual. You who live in the Hub do not, perhaps, realize as fully as some of the rest of us what immense things have been accomplished in the last thirty-five years in this country and abroad. In 1860 there were hundreds of thousands of children who had no access to school privileges which were worth mentioning. There are thousands and tens of thousands to-day ; but we can say

now, what was not true in 1860, that nearly every community in the United States has recognized in principle, at least, that it is a public duty to assist the individual and the family in the matter of education, at least to the extent of placing within its reach, as far as at all possible, the chance of getting free tuition in a public school for a certain number of years. The principle carried through it is tried only in a halting manner. Even our largest and wealthiest cities, New York and Philadelphia, turn away many children who would like to attend school because there is no room for them or because there are not teachers enough. In many places the schools are very poor affairs and are open only a few weeks in the year, the teachers are in many cases very inefficient ; but no one can deny that along all these lines a steady and rapid progress is discernible, and every one should be encouraged to take up the fight with new spirit, being assured that new victories await us in the future.

Every advance on the formal side of education, ending in the establishment of new institutions, has been accompanied by a no less marked though not so easily discernible advance on what, for lack of a better term, I may call the ideal side. That is to say, the public consciousness is becoming more and more sensible of the fact that we need a more thoughtful, careful, persistent study of the nature of education itself, and of the further fact that we may determine, to a very large extent, what particular share of this educational work we shall assign to the various institutions mentioned above. In other words, we have already begun consciously to distribute the work of educating the child and to look to these various institutions for certain definite contributions to this all-important end. It cannot have escaped the attention of even the most careless observers in this field that the present tendency in human society is towards assigning a continually increasing sphere in the education of the child to public institutions. It has not been so very long — many of you can remember the time — since the education of the average child in this community was left entirely to the family, the street, and the church, with precious little of the latter. We now offer to the majority of our children the opportunity of free schooling for about eight years of their life, and to a small number the addition of four years more. In other words, we leave, at present, the education of the child until his sixth year entirely in the hands of the family. We then offer the family the opportunity of calling in the assistance of the school in the education of its younger members for the next eight years of their lives.

It will be noticed, of course, that the true public institution is here used in a twofold sense; namely, public as opposed to private,—*i.e.*, managed by the government as distinguished from managed by private individuals, and public as opposed to family. Thus a private school is really a public institution in the sense that it is a non-family institution. Now, the statement that I made is true in both senses; *i.e.*, the share in the education of the child which we assign to non-family agents is continually increasing and the share which we are assigning to institutions under government control is increasing.

The reason for this is, in my opinion, plain to see, and is not the one ordinarily given. It is not that the family or the church are decaying as educational instrumentalities. I am aware that there is a

sense in which they are both decaying. The family has been decaying, in one sense, for five centuries. Every step in the emancipation of the child and the wife has hastened the disintegration of the family by loosening the bonds which hold it together. But I do not believe there ever was a time in which the family really contributed as much towards the sound training of its children as it does to-day. I do not mean that the family at its best to-day is doing more along this line than it did a century ago, or even that it is doing as much ; but I do mean that the average family is doing far more for the proper training of its children to-day than the average family ever did before. Father and mother are, on the average, better educated and are more ambitious for their children than they ever were before.

The same thing, I think, is true of the Church. The Church at one time did relatively more than she does to-day, because at one time she offered almost the sole agency outside of the family. But I do not believe the time ever was in which a larger number of people were reached and trained by church influences than to-day.

It is not, then, in family or church decay that we are to seek the explanation of the growing importance of public education. We find it, I believe, in the simple fact that our standard of education is higher than it ever was before. We insist to-day on a grade of education so generally diffused that neither the family nor the church nor both together can even approximately satisfy us. We have agreed, I think, that the State must come to the aid of the individual and family in this respect. We have gradually increased the extent of this aid, and now we are face to face with the question whether a further step shall be taken.

One of the great questions now before the educational world is this : Can the family properly look out for the education of the child until its sixth year, and, if it can, does it actually do so, or can we insure its doing so ? It is this question, then, to which I first ask your attention.

We all agree, I think, and at least the society in which we live is agreed, that the family cannot, or at least will not, properly look out for the education of its children after the sixth year. Now what is the basis of this conclusion ? As I look at it, it is simply this : There is a certain minimum of knowledge and training, both mental and moral, which, for the safety and welfare of society, it is necessary should be realized in the great majority of its members. This knowledge and training — education we may call it — can be best acquired in the years from five or six to fourteen or fifteen. If the opportunity for obtaining this minimum is not placed within the reach of the mass of our children at a small expense within those years, it will not be sought either by the children themselves or by their parents for them.

If this be a correct statement of the case, it is evident that our present arrangement is justifiable only on condition that the completion of the fifth year marks the period at which the public education of the child, as distinguished from the family education, may best begin. Whether this be so or not is one of the most vexed questions of pedagogical theory, and I shall not attempt more than to indicate briefly my views on the subject and give my reasons for holding them. We must first state the case clearly ; and we shall find, I think, that

such a statement will contribute very much towards our arriving at substantial agreement on the most important of the points at issue.

When one speaks of public education, most people think of the education which is given by our schools as at present constituted. This is the source of the first difference in opinion, which clearly arises from a misunderstanding. We may grant that the beginning of the sixth year is the proper time for the child to enter school, as that institution is at present organized, and to take up the routine of school duties, and yet maintain that the public education of the child should begin at a much earlier age. All that is necessary to reconcile these two positions is to insist on the necessity of a different institution, which shall look after the education of the child prior to its entering school. This is practically the position of a large and growing body of theoretical and practical educationalists, and I fully accept their opinion in this respect.

Whether five, six, or seven is the proper age to begin school-work is not by any means a well-settled point; but we may take it for granted, I think, that the time will fall within those limits. Suppose we accept as the proper age that which is generally taken as the beginning of the so-called legal school age; namely, the closing of the fifth year. For the sake of argument, then, we may grant that children should not attend school before the age of six years. On the other hand, we maintain that the public education of the child should begin much sooner, meaning by public education simply a systematic training outside of the family and in company with other children, with a view to developing and training the powers of the child-mind. This can be best accomplished in a special institution organized for this particular purpose,—an institution which shall bridge over the chasm between the nursery and the school. Such an institution the kindergarten claims to be. There are, therefore, two points to be considered: first, the reason for such an institution; second, the extent to which the kindergarten satisfies the demand.

In discussing the reason for and the necessity of such an institution, I shall appeal to two classes of facts: (1) those of physiology and psychology, and (2) those of the daily life of children, which are patent to us all. Professor Bain, in his "Education as a Science," calls attention to the fact that "the brain grows with great rapidity up to seven years of age. It then attains an average weight of forty ounces in the male. The increase is much slower between seven and fourteen, when it attains forty-five ounces; still slower from fourteen to twenty, when it is very near its greatest size. It would seem pretty clear that there is some connection between intellectual power and brain-growth. Consequently, of the more difficult intellectual exercises, some that would be impossible at five or six are easy at eight through the fact of brain-growth alone. This is consistent with all our experience, and is of value as confirming that experience. It often happens that you try a pupil with a peculiar subject at a certain age, and you entirely fail. Wait a year or two, and you will succeed, and that without seemingly having done anything expressly to lead up to that point, although there will inevitably be within that period some sort of experience that helps to pave the way. In regard to the symbolical and abstract subjects, such as arithmetic, algebra, ge-

ometry, and grammar, I think the observation holds. A difference of two or three years will do everything for those subjects.

"This, however, is but one aspect, although a very important one, of the varying rate of brain-growth. If we follow the analogy of the muscular system, we shall conclude that the times of rapid growth are times of more special susceptibility to the bents imparted at those times. If the brain is still unable to grapple with the higher elements, it is making or may make great progress with the lower. Whatever it can take hold of, it can fix and engrain with an intensity proportionate to its rate of growth."

These two facts indicate the Scylla and Charybdis between which the educationist and the educational system must steer with great care. On the one hand, we must be careful not to introduce any elements into the education of the child which are out of the reach of its intellectual effort, as that might dwarf and stunt or even destroy its growing powers. On the other, we must be sure to introduce them just as rapidly as the mind grows up to them, or we shall fail to make the desired impression at the right time. If we begin too early, we may interfere with the powers needed for growth; or, if it should not be quite so bad as this, it will take a much greater expenditure of nervous force than would be necessary at a later stage. We begin too late if we allow time to pass by when good and useful impressions could be made with perfect safety to physical and mental health.

This point is so exceedingly important that I may be pardoned if I repeat it in a little different form. In the physical growth of the child it passes through a series of stages, at each of which the wants of the body call for a different diet. If you attempt to feed the young infant on bread and meat, you will, in all probability, destroy the organism. If you fail to incorporate the proper elements in its diet, the result will be seen in impaired nutrition and backward development. It is just as fatal to healthy growth to fail to add the new elements as they are needed as it is to introduce them prematurely. There is a succession of tides in the physical development of the child which must be taken at their flood if we are to hope for the best results. It is just so in his mental development. When the time comes for a given impression, and the time goes by without it being made, it is a lost opportunity,—gone never to return. At the very least, it means that the impression, if it ever be gained, will be acquired at an increased cost, while it may, also, and often does, mean that it will never be acquired at all. I cannot help believing that the old education erred not only in the direction of introducing subjects to the child prematurely, but also, and quite as seriously, in the opposite direction of failing to introduce much to the child in its earlier years which it should have introduced; and to-day we are, I think, much nearer correcting the sin of commission than the equally serious one of omission.

We have not as yet obtained a satisfactory estimate of the relative educational values of the different years of childhood. But nearly all observers and students of the subject, nearly all psychologists and thoughtful teachers, agree that for certain classes of impressions the first six or seven years of the child are worth all the rest put together. Why do we find so many dull children in our families, in the street,

and in the school? I believe that we shall come to see more and more with the lapse of time that our education or lack of education is responsible for very much of this dulness. The crisis in the child's life came and passed unnoticed. No thoughtful helper was at hand to offer just the food which his mental stomach craved; and, when the food came, the time for it was long past,—the child had been practically condemned to become a dwarfed and stunted member of society. So much for what I should call the physiological argument.

It is not necessary, however, to go to physiology or psychology for a very striking and, to my mind, conclusive proof that the period between the nursery and the school is one of the most valuable of all for conveying and deepening impressions. How many of us have seen, either in our own children or those of others, or both, most striking evidences of an all-pervading and never-resting curiosity! The child wishes to know everything, and asks endless questions about things above and beneath the earth. Now, this insatiable curiosity, which is in the child only a reflection of the same quality in the race, may, under proper guidance, become the most powerful of educational instruments. But how often, pray, is it under such guidance? It is the rule that this most valuable of all mental attitudes is gradually worn away by the conduct of mothers, of fathers, of sisters, of brothers, and friends. "Go away! don't bother me, you little fool, with your eternal questions! you are enough to try the patience of a saint,"—is perhaps the most common form of putting a quietus on the questioning spirit. It takes a long while, sometimes, even with such vigorous treatment, to kill out or beat down this desire and practice of questioning everything. But it has generally so far succeeded by the time the child starts to school that the teacher must begin her work by trying to revive this passion in the child by her cunning devices. It cannot be expected that the average parent, or even the average servant-girl, to whom our wealthy people leave their precious charges most of the time, can be prepared, I will not say to answer all these questions,—for that not even Solomon with all his wisdom could do,—but to take advantage of these questions to direct and train the child's attention along lines from which it can hope to derive profit. Nobody can do this in a satisfactory manner but one who has made the study of child-life and the mind the serious occupation of his life. And, when we think of the glorious opportunities which are all the while being lost to our children for the lack of just such people in charge of them, it makes the heart sick on account of hope deferred; for how can we hope to see society move on at any reasonable rate of speed so long as we allow these invaluable powers to go to waste in the present wholesale manner?

But there is still another reason why there is great need of an intermediate institution between the nursery and the school, and that is the great desire on the part of the children who have grown old enough to run out of the nursery for the companionship of their fellow-children. It is not necessary for me to enlarge upon this thought. It is a fact patent to all. Nor is this a desire which it is safe not to gratify. Since our children must live in the society of their fellow-men, they cannot begin too soon that education which comes from well-ordered intercourse with their equals. The moral education of

the child does not, practically cannot, begin until he comes in contact with other children of equal age, and tries to live with them and enter into their lives and let them enter into his. This element cannot be found within the family. It must be sought without. The question then comes, Where is it to be found? As a matter of fact, it is generally sought in the street,—oftentimes without any supervision, generally with no better supervision than that which an elder brother or sister or a servant-girl can give. It would not seem to need much argument to prove that the education of the child in all that relates to his duties to his fellow-men can be best begun by such intercourse with his fellows, under the care of one who has made it his business to teach and train such children.

If these considerations be just, it must follow that there is great need for some kind of an educational institution which shall begin with the child as soon as it leaves the nursery and take him along in the years which elapse until his mental maturity is such that he is fit to enter the school and take up its systematic and long-continued labors. It will not do to say that the family can and will do this. The average mother has no time to look after the intellectual and moral development of her child in the proper way. Even if she had the time, she is utterly unfit by education and training to undertake any such thing; and, if she attempted it, she would likely do more harm than good. Moreover, the very best mother cannot by any possibility be to her little child what his playmates are. She cannot take their place as companions for him; and, wherever it is attempted, the results are disastrous in the extreme. The more confident a mother is that she can do this, the more striking the proof of her utter unfitness for the work. Such an institution, then, is a necessity, not only for the poor child whose outdoor life must be spent in the street, but just as necessary for the child of parents of wealth and leisure. It is, in other words, a permanent category in educational life, and should form an integral part of every educational system.

Now, the kindergarten claims to be just such an institution; and I believe that, in its best specimens, it fairly justifies the claim. I am aware that there is much nonsense talked upon this subject. Some of its most enthusiastic votaries, who are at the same time its worst enemies, talk as if it were now a perfect institution,—a very absurd claim, of course, in view of the fact that so much is still unknown about the limits and sequence of the development of the human faculties. After making due allowance, however, for all the curious vagaries of the friends of the kindergarten, it must still be admitted that there is a valuable residuum left which is worth our serious attention. It is, at any rate, the only thing we have. At its best it is very good, and at its worst is capable of improvement, while, as a rule, it is vastly better than nothing.

It now remains to discuss the relation of the kindergarten to our public educational system. If you have followed me thus far, you will have no difficulty in inferring my conclusion that the kindergarten should be made an integral part of our system of public education. If it supplies an imperative want of society, and at the same time a want which private enterprise will not supply, there remains only one thing to do, and that is for society to assume the burden of

its support. That private enterprise will not supply it adequately, I think, is perfectly plain from the whole history of education. In no free country, at no time and under no circumstances, have large educational institutions of a high rank been supported entirely at private expense. It was formerly the argument against free schools that, if there were any real demand for education, it would be met by the establishment of new schools; and as for those people who would not or could not pay tuition, why, they would not send their children anyhow, since people valued only that for which they paid something. Adam Smith said a century ago that "an elementary school system could be supported from fees alone." There is no doubt about that, I suppose. The whole question is whether such a school system would be worth anything or not. It is certain that no system of schools which is expected to reach the great majority of our children could at the present day be supported by fees alone; and so convinced have we become that popular education in the widest sense is impossible, except on the basis of free schools, that we have now formally adopted that system in every State in the Union. So successful has it been that it is only a question of time, and that not a very long time, either, when the leading European nations will follow our example.

The same thing is true of the kindergarten as of our schools. Its advantages will never be open to the masses of the people until it has been incorporated into our public school system and thrown open free of charge to all children in the community. The drift of events is steadily towards this consummation, and all the signs of the times indicate its steady though at times slow approach.

This policy is to be justified, in my opinion, on the same grounds exactly as those which have been urged with so much success in favor of the free public school. It is necessary to secure a certain minimum of education in the great mass of the people,—a minimum, too, which, thank God! is continually rising. We cannot hope to get this minimum if we allow the three years of most favorable opportunity to go to waste, as we are now doing. What would be the objection to putting the school age from ten to eighteen instead of from six to fourteen, as at present? There would be two very serious objections: (1) four of the most valuable years of the child would go to waste, making it simply impossible ever to achieve any valuable results; (2) not more than one child would go from fourteen to eighteen where twenty would go from six to ten. Even as it is now, the great majority of our children do not go after they become ten or twelve years of age, so that the practical school age, under present circumstances, does not include more than four or five years for most of the children. The decrease in the number of children, as one goes up in the school grades, is one of the most lamentable facts of our educational system. Now, it may be possible to prevent this to some extent by changing the character of the schools in the direction of greater practicalness, such as would be secured by the general introduction of industrial training and similar improvements; but the real cause of most of this decrease, particularly in the upper grades, is to be found in the fact that the children at ten or twelve can begin to earn something, and as soon as they can they must. This cause is likely to be an

enduring one, and we cannot probably remove it for a long time to come.

The case lies, then, as follows: three years from the nursery to the school wasted, or worse than wasted, for educational purposes; four or five years spent in the school,—a period which is utterly inadequate to acquire the desired degree of education, and no great hope of extending this period for some time to come. What shall be done? It seems to me the answer is clear: utilize those three years which now go to waste, and during which you can get hold of the children, and thus make up as far as possible for the years which you cannot get from ten or twelve to thirteen or fifteen. Do not misunderstand me. I do not wish to shorten the school age at all, rather lengthen it, so that as long as there is a child, youth, or adult in the community without an education he shall have the opportunity to avail himself of such advantages as are offered. But by all means utilize these three years, by which you may lengthen the actual period of education to the average child from four to seven years, because in this way you can attain the best educational results. The free public kindergarten may be justified, then, on the ground that it is the best, if not the only, means of attaining the object of all public educational systems; namely, popular education. It is the usual testimony of thoughtful teachers that children who have had three years in a good kindergarten can make much more rapid progress in their regular school work than those who have led the hap-hazard sort of life which generally falls to the lot of children in that period; and, whether this be so or not, no one can doubt who has studied the subject that the life of the kindergarten pupil is fuller and richer by far than it would have been without this training.

I am fully aware that this step means a very large increase in our appropriations for school purposes, but I believe that it will richly repay us for all our outlay.

The most striking fact in our modern financial budgets—local, State, and general—in this country and in Europe is the rapid increase in the expenditures for school purposes. It has already become the largest single item in our local and State budgets, and all the indications point to its early incorporation in our national budget; for, if the Blair Bill passes, or any similar one, the federal government will begin a policy which, in my opinion, will not be stopped, of making large annual grants to the cause of education. This large expenditure, in spite of mismanagement and misapplication, has proved, as a whole, very profitable to the communities which have made it; and I believe that we are just making a fair beginning in this direction. We shall make heavier and heavier outlays for this purpose.

On the other hand, I believe that such outlays, viewed merely as investments of so much capital on the part of society, will make the largest kind of returns.

The educational policy of a country should be directed towards developing all its intellectual wealth, just as its economic policy should look towards developing its material wealth. Our present educational system, both in its lower and higher members, is as incomplete and unsatisfactory, when viewed from this aspect, as would

be our economic policy if, instead of encouraging by our laws the rise of many or all kinds of industry, we should direct all our efforts towards utilizing our coal deposits alone. It has not been so very long, for example, since the only kind of higher institution in this country was the old-fashioned college, with its iron-cast course of Latin, Greek, and mathematics. The only kind of talent which we, as a country, were utilizing was that very scarce fraction which could be developed by an exclusively literary training. Even in the common school "readin', writin', and 'rithmetic" formed the beginning and the end of all "larnin'." Those to whom the most mechanical presentation of these subjects did not appeal were voted hopelessly dull, and forthwith shut out from all so-called higher education. One hundred and twenty-five years ago the only so-called higher institution of learning in the country was the college, the only secondary institution the academy, and the only primary school the old-fashioned a-b-c and parsing machine. There was no medical, dental, law, veterinary, or technical school of any kind; no normal school, no industrial school, no school of art or design, no business college,—nothing, absolutely nothing, but the college and the theological seminary. Every step of our educational advance has been marked by the establishment of some new kind of school, or the expansion of some old one in such a way as to amount to the same thing. The rise of these new institutions has been accompanied by an enormous increase in the material and intellectual resources of the race. It is fair to claim that the enormously rapid growth of modern communities in all that distinguishes civilization from barbarism, as compared with ancient communities, is due to the fact that we are at last beginning to utilize for the first time in human history some small part of the intellectual power of the race. Just consider for a moment. The ancient Greek had no place in his society for the student of natural science,—no place for a Galileo, or Newton, or Huxley, or Helmholtz, or Harvey, or Pasteur, or Stephenson, or Watt, or Whitney, or Edison,—no means of calling them forth, no means of encouraging them if they had been at hand, or, rather, a most efficient means, which he was not slow to use, of forcing them down and eliminating them from society. Even such a man as Socrates thought that people who busied themselves about such things were worse than useless, and at least should be the slaves of the rest. That was twenty-two centuries ago, and yet it has only been within the memory of some of the youngest of us that even the most advanced of our American colleges have finally opened a place for such men within their sacred walls. The whole history of human education—nay, of human civilization itself—is but the history of a long series of melancholy attempts to limit in every possible way the development of new talent and ability. It is only within this century, and indeed almost within this generation, that we are finally coming to see that there is an infinite variety of human talent and taste and an infinite variety of possible science, and that we can expect to utilize the former fully for our benefit only when the latter is made as accessible as possible to all alike. This means, of course, the establishment and development of new kinds of schools, which shall bring home to each type of mind in our society the opportunity of finding that for which it is

especially and peculiarly suited, and this in spite of much opposition from some quarters ; and, all too slowly in most places, we are finally making up our minds to do, and have, indeed, already made a fair beginning in that direction.

This work is important, and must and will go on. But there is another aspect to the question which especially interests us in this connection. All these institutions are for the advanced child,—the child whose tastes are already to some extent formed or destroyed,—the range of whose senses has already been, to a great extent, circumscribed. If we would be consistent, if we would attain the most valuable results, we must go back of this point in our educational processes ; we must get at the child during the period of most rapid growth ; we must seek an opportunity to call forth and train in the right way all its mental powers, to evoke, if possible, all the varieties of its activity at the very time when this can be done to the most advantage. It is only in this way that we can hope to awaken and keep alive all the possibilities of the future man, only in this way that we can hope to develop and utilize all the mental wealth of our society.

The kindergarten, or some institution of that kind, can do this very work. It can take the child at the earliest practicable age ; can train its eye to see, its ear to hear, its tongue to speak, its hands to do ; can call forth and train its sense for beauty, for color, for rhythm, for order, both in the material and moral world ; can develop its sense of duty and justice, thus helping it into right relations towards its surroundings in the home and in society,—all things of fundamental importance to every one of us, rich and poor, laborer and capitalist, ignorant and wise,—and, moreover, all things which can be best started in those very years, and should be started under proper guidance. A wrong bent in this period, a neglect at this time, can never be made good by any amount of after training.

If we are agreed, then, so far (1) that the kindergarten or some similar institution is necessary to a complete educational system ; (2) that it is a logical and necessary complement of our present system of free public education, if the ends for which the latter is organized are to be achieved ; (3) that it is bound to become an integral part of this system,—the only remaining question is this : What is the first thing to be done by those who wish to bring about this ultimate result as soon as possible ?

It is not necessary to say to you that the character of a school is determined by its teacher : we all know that. The same thing is true, in a still larger sense perhaps, of the kindergarten. Whether the kindergarten is worth anything or not depends entirely upon the teacher ; and the first requisition, therefore, in any system of kindergartens is to have a sufficient number of properly qualified, specially trained, kindergarten teachers. The supply of such teachers will not be large enough unless there is an adequate opportunity for their proper education. Such an opportunity can be found only in public training schools for kindergarten teachers, and such schools we must have if we wish to see the kindergartens generally established.

In conclusion, I would summarize what I have already said : —

(1) That the three years preceding the school age are, for certain educational purposes, the most valuable years of the child's life.

(2) That under our present system of public and private education these years are, relatively speaking, wasted.

(3) That this waste is just as general among the rich as among the poor, and is little less ruinous to the former than to the latter.

(4) That it may be largely saved by the general introduction of some such institution as the kindergarten.

(5) That such general introduction is only possible in the form of free kindergartens, established in connection with our public schools, in sufficient numbers to accommodate all children sent to them.

(6) That the necessary outlay for such kindergartens would be amply repaid to society by the increased productiveness of the generation educated within them.

(7) That, owing to the economic condition of our society which prevents the majority of our children from going to school beyond the tenth year, the only means of securing the minimum of education absolutely necessary to the welfare of our society lies in utilizing for educational purposes the three years preceding the school age, and the only institution which promises to do this is the kindergarten.

(8) That the essential condition of success in this movement is a supply of properly trained teachers, which can be insured only by the establishment of adequately equipped training schools for kindergarten teachers.

DISCUSSION.

Mr. S. T. DUTTON, Superintendent of Schools, Brookline.—I have been asked to say a few words on the paper that has been read. Professor James has summarized it so clearly that I need not spend any time in review. We have certainly been impressed with the breadth and discrimination with which he has treated this interesting theme. As I understand this Conference, it is for the purpose of a revival; and it is desired to bring under conviction those still in doubt and darkness in regard to this modern feature of education.

It seems to me that Professor James has addressed himself not only to the individual who is unrepentant, but to the ninety-and-nine who need no repentance. He has strengthened our position and given new reasons for the faith that is in us.

If I were to undertake to add a word of argument for those who are still doubtful in regard to the validity of the kindergarten, I would say, Go and study the kindergarten. If it is possible for a person to hold himself together long enough to sit down patiently and quietly and try to translate what is to be seen in the kindergarten, I think he will find there sufficient argument for its existence. The trouble is that very few people can do this. They are not able to look beneath the surface. The majority of people who visit the kindergarten see the children, admire their games and plays, but are not able to understand the subtle, underlying reasons for its existence. They cannot see growth as it is going on. Of course, we cannot see growth. If we go into a garden of plants or a field of corn, we cannot see growth; but we can see whether the conditions are favorable for growth, whether the soil is adapted to growth. I think sometimes that, if kindergartners who are specially fitted to do this would try

to interpret to others more than they do the peculiar mysticism that seems to belong to it, they would do a great and good work.

The most that I have to say bears upon what was presented in the latter part of the paper on the relation of the kindergarten to our educational system. Here is something that is very important and practical. How are we going to carry the spirit and purpose of the kindergarten into the grades unless the kindergartners are ready to go into the grades and work and help others to understand what can be done, unless teachers are ready to sit down with the little children and try to understand what is back of this system of education? It seems to me entirely illogical and wrong to place our seed in a certain soil, and under certain favoring conditions, and, when the tender plants begin to come up, to transplant them to conditions less favorable. In other words, if the self-activity, the self-direction, the industry, the moral teaching, of the kindergarten, are legitimate, if they constitute what is vital in education, it seems to me that these elements should be carried up into every grade of the school, grammar and high. It is illogical and wrong to permit our children to enter the kindergarten or the primary school where these principles of self-activity, freedom, and self-direction are working, and then to permit them to pass on to a different set of conditions. It matters not whether the child is in the kindergarten proper or in the primary school which has the spirit and life of the kindergarten: if he goes on to a grade where these things are not, he suffers violence.

Just for a moment let us ask about these principles of the kindergarten, some of which Professor James has not mentioned. Take this one idea of *self-activity*. What is it but the idea which every teacher tries to incorporate in his work,—that of having the pupil do his own thinking, having the pupil work out his own problems, search for his own specimens, and make his own investigations? Is it possible that there is no conflict between the kindergarten and the school? Should not these things be carried up more than they have been? And yet is it not true that it is only within a few years that the average high school has applied this principle of self-activity in the teaching of science or in the teaching of history?

Another fundamental idea is that pupils *learn by doing*. We hear a great deal said about that; and it is a very practical principle, as we all know. It can be expressed—and to my mind is a great deal better expressed—by the old proverb that “experience is an excellent teacher.” Experience embodies more of what is true in education than any other word in the language. Is it not important that this idea should be carried up into every grade of our schools? Froebel never would have been satisfied to have a child hear about something or read about something or see a picture of something or even see the thing. There is something still beyond that, and that is to experience it. If there is any one thing that should be carried into our schools to-day, it is this idea of experience. As I think of the opportunity for illustrating this principle in such a community as this, it seems to me that we are apt to be blind and dumb, as it were, in the face of the opportunities we have. Think of the opportunities in this community to teach history by experience, by having our children come into actual contact with sources of history instead of

having it simply pictured to them or having them read about it! Or, in the field of science, the same thing is true. This has been impressed upon me within a few days, having visited some of the collections of science in Boston and Cambridge which are open to the pupils and teachers of every grade of school, and which, I am sure, are seldom visited, seldom used.

Take again the general idea of unity which we know belongs to the kindergarten. Is there not something here that in some way must be carried out and fastened upon every step of our work? I had the pleasure this morning of spending a half-hour in the kindergarten. One division was working with some geometrical design, another was working in an exercise in drawing. I noticed that the teacher in each case called attention to the connection, or it was expressed in something that the teacher said. It was made evident that something was being done in an orderly and logical way. I am happy to say that we find this principle illustrated more and more in our public schools. I am not blind to what is being done and what has been accomplished. I am thankful that we see more readiness to note what the kindergarten is and what it is doing. We see boards of education more ready to appropriate money for the establishment of kindergartens, although we do sometimes hear of boards that are inclined to go backward. How they can do it, or how intelligent citizens will allow them to do it, is more than I can understand. There is no other system yet devised that will do what the kindergarten is capable of doing at that particular time when the important gap between infancy and the school must be bridged over.

If we had time, I would speak of the social argument, the fact that this industrial and moral element in the kindergarten is calculated to act as a curative and as a corrective of the tendencies which are in so many children, and which never can be rooted out except by the most patient system of training, begun very early and carried on beyond the danger point. I think this question will ultimately be settled on those economic grounds that have been mentioned: that it is cheaper for the State to plant kindergartens and give the children these opportunities than to see them grow up to appear eventually in the police courts. It is a matter of economic necessity to take these steps, to plant kindergartens and make them the natural and appropriate introduction to the school life. When a man like Professor James studies the kindergarten, he finds in it not only much more than he expected in the way of food for thought, but he finds a cause worthy of his effort and feels disposed to work in its interest. I am thankful that teachers generally are looking with more deference toward the kindergarten, and are willing to study it. They have a great work to do in this direction. Kindergartners must not stand aloof and criticise the schools, but must show constant readiness to help the teachers; and there must be united action. As long as kindergartners hold their meetings by themselves and other teachers meet by themselves, we shall never reach the best results. Let us remember that it needs the united, earnest work of every one in the profession.

DR. LARKIN DUNTON.—What is the relation of the kindergarten to that special system of work which we call manual training? Looked

at from one point of view, it is the relation of a part to the whole. The work of the kindergarten is a part of manual training. The kindergarten starts the child in the course of action along which he is to be continued by manual training. The intellectual activity in both is similar. In each the pupil is trained to the exact conception of form and action. He is led, not merely to image what has been perceived by him through close observation, but to form definite conceptions of objects yet to be created and of the actions by which these objects are to be produced. One of the most valuable parts of kindergarten work and of manual training is that which gives the child the power to create in his own mind exact ideas of the forms and actions which he is to produce. The physical action required both by the kindergarten and the manual training school is similar. It is the actual process of producing something from the material before the child. It involves the activity of creative energy. Then, too, the aims in both bear a strong resemblance. In both the child is striving to create something of use or beauty. It is well to keep the idea of utility in view pretty constantly both in the kindergarten and the manual training school. The child is to be made to strive for the creation of what will be of real value to others. He is to be constantly led beyond his own selfish desires. The result is a common one. It is the awakening and deepening and strengthening of a spirit of generous self-sacrifice and devotion to the good of others.

Now, how is it possible to train children in the kindergarten, in the manual training school, in the primary school, in the grammar school, in all schools, so that they will be carried along in the same line of intellectual, moral, and physical development? How is it possible to unify all school work, so that nowhere will teachers be working at cross purposes? It may be summed up in a few words,—let none but teachers teach. Prepare all who are to do any part of the work so thoroughly that they can not only do well the special part which they are to direct, but that they can look intelligently over the whole field and see the end from the beginning. Every teacher in every grade, from the kindergarten to the college, should be thoroughly trained in the general theory and practice of education. Then he should be specially trained for the particular kind of teaching in which he is to engage. If the kindergartner knows only kindergartening, if the sewing teacher knows only sewing, if the manual training teacher knows only manual training, the singing teacher only singing, and so on to the end of the chapter, each will be constantly contradicting the others, and there will be lacking that continuity of aim and plan which makes all parts of the educational process one consistent whole. We shall never succeed in harmonizing the kindergarten and manual training with each other, and both with all other departments of education, till we exclude untrained teachers from the work of teaching. Let none but teachers teach.

Mrs. LOUISA P. HOPKINS.—When I enter a kindergarten, I feel that I am in the first stage of the general public school education. I think we are apt to forget that the kindergarten is not an institution entirely separate from all other schools, but only the first start in the school education of the child. I like to feel also that there we get the initiative of the true spirit of education. I feel so strongly that

the spirit is the essential thing that I like to mention that as the initial ideal to which we should direct our attention.

I visited the other day a kindergarten in the midst of one of our primary schools, as it should be, and, while attending the exercises, the children and teachers of two lower classes of the primary school were invited in to take part in the kindergarten games and songs; and there we had a most beautiful mingling of the kindergarten with the public school, in spirit and expression. I felt that it was like a baptism of the spirit of the kindergarten upon the public school work. There was an ineffable sweetness and almost holiness about the atmosphere of the place. The children's faces were all lighted up with real inspiration and interest, and one could almost see a tongue of flame on the forehead of the teachers. I cannot express the spirit that pervaded the whole scene. The copy of the Sistine Madonna which hung upon the wall seemed its only adequate expression. I saw then how easily and naturally the spirit of the kindergarten could be adopted into the whole method of education.

Professor Adler spoke of the intellectual power of manual training, and its influence on the various departments of school work, and finally of its moral power. That has been emphasized in my own observation. The effect of industrial work in the schools has been regenerative. It acts as a tonic upon the moral activities as well as upon the intellectual. I should like to give one or two instances of its effect as a moral tonic.

I have a favorite little story which makes this quite plain to my own mind. It is the story of Tomowski, a little boy who had been sent to the reformatory, or truant school, out of a primary school. He had been altogether a bad boy, as the teachers sometimes say of a boy who has followed a very distorted course of development. He had come back from the truant school, and was again at the door of the primary school. He was about fourteen. He was well known as one of the most troublesome of children, vicious, mischievous, out of school as well as in, and so far behind in his intellectual development that he was suspected of being partially imbecile, so far as school-work was concerned. The teacher, a wise woman, full of sweetness and light, said to herself, "This boy, though not advanced enough for my class, would be so hard for any other teacher to take charge of that I think I will put him into my own class." As she led him into her room, thoughts flashed quickly into her mind in regard to her treatment of him. She made no reference to his history. She put a good boy on each side of him, and then she called him up and asked if he could go out doors and find three very nice plantain leaves for her to use. He was pleased with the confidence she placed in him, and said he thought he could. He returned as soon as possible with three fresh, whole plantain leaves, and handed them to her. She gave them to him and the two boys beside him, with paper and pencil, telling them to make a picture of the leaf, either by drawing or tracing. The children went to work with delight. The leaves were drawn, and the teacher praised Tomowski. Then she gave each a little vial of colored wash and a brush, and asked them to color the leaves and make them look as much as possible like the plantain leaf. Next she gave them each a pair of scissors,—one of

those which a certain supervisor had carried to the primary school-teachers and which had been received by many with a smile of incredulity,—and said, “Now cut the leaf out that you have drawn.” This was soon accomplished. She then placed all the leaves on a screen, putting the names of those who had made them against the copies, which were side by side with the real ones, and gave a lesson to the class upon the leaves,—a very attractive lesson to the children and one in the usual course of lessons given there,—after which she went on with the regular exercises of the room, in which Tomowski showed a very positive and steady interest, and which he accomplished in a satisfactory way. During the whole session she had no occasion to be reminded that he was a bad boy.

The next morning she placed him as before, and brought out some clay, and showed him how to make a clay leaf. He took great pains, and manifested decided aptness for it. The clay leaf also was put on exhibition.* In that way the teacher proceeded, giving some form of manual training, something which engaged the child’s active participation at once, which gave him self-respect, and an opportunity to measure himself as a good boy by other good children, and made him feel that he, too, could do something worthy of commendation, and be of some use. Every Friday this teacher had the habit of inviting parents and friends to see the boys, and the work that had been accomplished during the week; and Tomowski’s work was always among the best. His name was always placed with his work. It stood for his individual reputation, and gave him a new consciousness of power and courage to do his best. At the end of the year she had never had occasion once to correct this boy. He had never been late or absent. He was no longer a truant, but a clean, respectable boy. He had taken hold of his intellectual work with such vigor and success that he had outstripped the whole class and was prepared to skip a grade. He felt that his past history had been effaced, and that he could begin life anew. I wish I could say that the boy remained under such influences; but, as a matter of fact, he went to a class into which the kindergarten spirit and methods had not crept, and Tomowski is back to-day in the truant school.

That is only one instance, of which I might give you twenty, to show the subtle effect that manual training has on the moral growth of the child. This case may be regarded as an illustration of many points referred to in the last two papers, which Professor Adler especially presented.

Wherever manual training is introduced, I hope it will be recognized that its educational value is as great for girls as for boys. We are apt to forget how many girls are aching to put their thought and feeling into some form of expression. But, when we remember that a young lady, a recent graduate from the Institute of Technology, has just been called to Chicago to superintend the erection of the building she designed for the department of the women’s exhibit in the Columbia Exposition of 1892, when we think how much it is to her,

* This little plaque may be seen here to-day in the manual training exhibit of the Boston primary schools; and to my eye its natural and graceful outlines are the sign manual of the free spirit of truth waiting for expression in right activities, which may be developed even in the most discouraging of our children.

and how much pride we all take in it, that she is able to express her own individuality and her own ideals in such forms, we must remember to leave the field free to all, girls as well as boys. We have too long relegated our girls to the cooking-school and the sewing-room as their only sphere of manual activity; but I hope we shall wake up to the truth that girls need the same liberty of selection as boys, so far as the expression of their feeling and thought is concerned. They have great thoughts that long to take shape, and we must leave the field free for all.

MR. ORSAMUS B. BRUCE, of Lynn.—I am glad that this movement is making rapid strides. In Boston it is really receiving the attention due it. One thing that has impressed me in my conversation with teachers in this city is the necessity of bringing the kindergarten methods into the primary schools. With that view, teachers here are studying the gifts, occupations, methods, and principles of the kindergarten. We on the outside, who are not all superficial observers, are looking at it from all sides. I see no reason why we should not take up the methods and principles and carry them right through. We can take up the clay-work, paper folding and cutting, observation lessons, and "busy work" in our teaching. So with manual training and physical training. They can be carried forward in orderly sequence in primary schools. There ought to be an interrelation between the kindergarten and the primary school. That must come. It seems almost needless to discuss the kindergarten as an element of the public school system, for it has revolutionized former methods or processes of primary teaching in this country. St. Louis already has 39 kindergartens in connection with the public school. Philadelphia has 38, San Francisco 28, Boston has 22, Milwaukee 22, and other cities have from 5 to 12. I agree with Mr. Seaver that the adoption of the kindergarten system is the most important step in public school education that has been taken for a generation. Mrs. Hopkins says that these schools have proved models of their kind in teaching and in organization, and they have served as object lessons to the teachers in primary schools. In Lynn we are trying through our training school to bring in the principles and methods of the kindergarten, so that our graduates can take them with them into the schools to which they may be assigned.

MR. C. C. ROUNDS, Principal of Normal School, Plymouth, N.H.—Professor James has laid out the outline in a suggestive way. We need to recognize in a broader way than we have the rights of the child. The question is, not what we choose to grant, but what he has a right to demand; and that which he has a right to demand is to be settled not by primary teachers, but by the citizens, by those who from an advanced standpoint look back to see what preparation must be made in the beginning. The discussion has suggested to me a fact which it would be well to know. The kindergarten as a separate institution has disappeared in the French schools, and the nursery school in Paris has also disappeared. At first there was the kindergarten in the *salles d'asile*; also, the day school or nursery, a charitable institution, to which working-women could take their children and leave them for the day. It seemed too bad that this time should be wasted, so more and more of an intellectual element

was introduced. Thus gradually the kindergarten was introduced. These schools, called maternal schools, were gradually adapted to the general public school system, and became so excellent that they ceased to be schools for the poor only, but became schools in which the children of the rich and of the poor were brought together. The teacher or assistant comes as early in the day as the women go to work. The children are left there by the mothers, and are taken care of and trained in kindergarten methods and work and in the work of the primary schools until four o'clock, when the formal exercises are through; but those that need can stay for some member of the family to take them home, until six o'clock, when the institution is closed. There is something suggestive in that as compared with the spirit of a recent editorial in a New York school journal, which makes reference to the claim that primary schools should be kept open to meet these wants, and condemns the plan because it would involve too much expense, and the teachers would have to stay too long. It brings up the question of the rights of the children. That system of maternal schools, taking the children at two and a half or three years of age and caring for them by a systematic, regularly organized course of study, incorporating kindergarten methods with the rest, until they were of regular school age, cost Paris, in the year 1888, \$747,000; and I think a better investment was not made in that city in that time.

If we could take the spirit of Professor James's paper with reference to the public school system, and then if a competent authority could decide what should come in and what should be left out, and not leave this for each separate organization to decide; if we could adopt the principle that whatever is to be in the life of the people shall be brought into the school system, and whatever is in the school system shall be brought into the normal and training school,—we should take a long step ahead.

Adjourned at 5 P.M. till Friday morning.

Fourth Session.

Friday Morning, April 10.

The Conference was called to order at 10 A.M. by President Walker. A paper on "Art Education in the Public Schools" was to have been read by James MacAlister, president of the Drexel Institute, Philadelphia. As he was not able to be present, a paper on "Color" was read by Henry T. Bailey, agent of the Massachusetts Board of Education for Art Instruction.

COLOR.*

BY HENRY T. BAILEY.

[After briefly introducing the subject by alluding to the interest taken therein by teachers of all grades, as indicated by the large amount of color-work to be seen in the exhibition, Mr. Bailey said:—]

We find ourselves living in two worlds, the natural or material world created by God, and the mental world created by man. An educated person is in correspondence with these two worlds. He can say with Emerson,—

"I am owner of the sphere,
Of the seven stars and the solar year;
[Material world.]
Of Cæsar's hand, and Plato's brain,
Of Lord Christ's heart, and Shakspeare's strain."
[Mental world.]

Our duty as teachers is to lead children to become acquainted with these two worlds: with the first, through the study of nature directly, whence arise the natural sciences; and with the second, through the study of what the human mind has achieved as recorded in institutions, literature, and the arts.

The pupil thus led studies astronomy, and in its more advanced departments he becomes familiar with the spectroscope. This reveals color. In meteorology he must take note of color. In mineralogy he finds color in lavish abundance. In chemistry color appears again, especially in operations with that wonderful substance, coal-tar. In botany he finds exquisite colors. In entomology he wonders at the marvellous color in wing and armor of insect. In ornithology he studies the varied and iridescent coloring of plumage. In zoölogy

*This address was illustrated by means of colored papers, revolving disks, large colored charts, and blackboard sketches, none of which are here reproduced.

color plays no unimportant part, and even in ethnology he must take some note of it. So we find that throughout the natural sciences color demands its full share of attention.

Turning our thought to the other,—the mental world,—we find that color has to do chiefly with the arts. Of these there are five: architecture, including all constructive arts; sculpture, including all plastic arts; painting, including all decorative arts; and, besides these, music and poetry. The language of poetry is oral and written speech; of music, tone; while the one language of all arts included under the three great arts, architecture, sculpture, and painting, is drawing. Drawing reveals truths of form in three degrees of completeness: first, outline; second, light and shade; third, color. No person can be said to know what man has done in any of the arts who has not taken into account the notable coloring exhibited in those arts through all time. If he has not considered the coloring of Greek temples and Venetian palaces, of Grecian sculpture and Chinese pottery, of Flemish canvas and Gothic glass, he has failed to receive from all these their richest lessons.

We see, therefore, that in the study of both nature and the arts we must not omit color. But man is creative. He will not be satisfied with the mere contemplation of color in nature and in historic art. He must use color himself. The study of what others have done should aid him in what he is about to do. His study of natural science led to the discovery of laws of matter and motion, and furnished the theory of all machinery. His study of color should lead to the discovery of laws as definite and to a theory of color as valuable.

When, however, we begin to talk about a theory of color, we provoke remark. Some one says, "Color in nature is one thing, and in the arts quite another." "Color is subjective, and a mere matter of taste," says another; "and, therefore, there can be no definite standards of color, and, if no standards, no theory." "There are no laws by which nature combines colors," says a third; "and hence in the arts no good coloring can be produced by rule: all we can do is to imitate nature." Without now considering the first objection, and passing the second with the remark that, if color is subjective, the power of producing the sensation is not, and that, practically, color must be considered to be objective, we will proceed to notice the others a moment. Let us admit at the outset that those who have strong "color-sense"—born colorists—do *not* consciously follow rules; that in any important school of historic art probably few, if any, knew a rule by which to combine colors; that color, with a master, *is* a matter of feeling; that in its highest phases the art of combining colors cannot be communicated. Great masters in any of the arts apparently transcend established rules and laws, and make others for themselves. In reality, they work upon broader generalizations, and include within their spacious circle the partial truths and imperfect laws of inferior men. But let us remember that, at the present time at least, for one artist there are a thousand artisans, and that for one who can produce good coloring there are ten thousand who can only enjoy it.

In our work we have to do, mostly, with very ordinary human

souls,—not often with an Angelo, a Phidias, a Turner, a Shakspeare, or a Beethoven. Therefore, let us not conclude too hastily that there is no standard of color, or that there are no discoverable laws underlying nature's combinations, or that there can be no theory of color which will aid an ordinary mortal in producing pleasing combinations.*

My purpose in this paper is not to elaborate a scheme for teaching color, not to present any novel theory nor to speculate upon the "moral effect" of color-training, but to present for your consideration a few facts, and comment thereon.

If color is to be taught at all, it must be taught methodically. We must begin by presenting to the pupil the whole of color at once.

"The *whole!*" some one says. "How can that be done?" This seems impossible at first, for we remember that the Persian colorists know seventeen hundred tints and shades which European eyes cannot distinguish. The Bigelow Carpet Company in Clinton have more than twenty-three hundred colors numbered and kept constantly in stock. Each year new colors are put upon the market, bearing such highly descriptive names as mummy brown, hair brown, écru drab, dragon's-blood red, Louis XV., Cythere, blondine, Maryland, ashes of roses, night green, and vivacious pink. Besides, there is great diversity of opinion among artists as to the precise hue of any given color,—for example, "olive." How, then, can we present the whole of color at once? Let us appeal to Nature: she gives us what we need in *the solar spectrum*. We find here *all* color potentially.

"But," some one objects, "the solar spectrum is not harmonious." It must be modified to express the "consensus of color-feeling in those persons who have given much time to its æsthetic study." Well, perhaps so (?); but we have the solar spectrum upon pretty good authority, I believe, and a question might arise as to whose "color-feeling" is likeliest to be right.

I remember being in a darkened room in Springfield, one morning, when a spectrum about four feet long was thrown upon the wall. The colors did not suggest our "subdued artistic grays," I confess.

The red was not gaudy, although intensely brilliant. The yellow and green were not vulgar. One was glorious, and the other blazed like an emerald. There was no trace of darkness in the blue and violet. They were richer than the deep of heaven, and one color melted into the next as dawn melts into day. The light pulsating tenderly throughout seemed to transform the band into a living thing, and I felt more like falling down in worship than like carping at God's color.

This spectrum is our only invariable standard of color. This should be thrown upon the wall of every school-room, and studied by the children. Sometimes this is impossible, and then a reproduction of the spectrum by means of pigments or colored papers may be substituted. The artificial spectrum should be *as nearly perfect an imitation of the original as is possible*,—not doctored or tinkered to suit some poor mortal's idea of what the heavenly spectrum should be.

For our purpose, it is not necessary to discuss how the spectrum is produced from sunlight, whether according to Newton's theory or

* Beyond this the address was not written. What follows has been reproduced from memory, assisted only by a few notes.

Goethe's. The fact remains that we have the spectrum colors, and that these, under different degrees of illumination from pure white light on the one hand to depth of gloom on the other, furnish us with all known colors.

An analysis of the spectrum enables us to separate at least six colors from the rest; namely, red, orange, yellow, green, blue, violet. Between these colors are an indefinite number of others called hues. Ten of these, at least, may be easily distinguished and named:—orange red, red orange, yellow orange, orange yellow, green yellow, yellow green, blue green, green blue, violet blue, and blue violet. By mingling the violet and red rays,—the two ends of the spectrum,—as is often done in nature, other hues are produced from which two may be selected,—namely, red violet and violet red,—making in all twelve hues. These eighteen colors under different degrees of illumination furnish material enough for such study as may be profitable to the average pupil below the high school; for, knowing these, he may proceed to classify them, and each new classification will reveal new truths, and lead toward the understanding of color as found in nature and the arts.

First, colors may be classified according to their *values*. In nature we find that a color changes in value according to the degree of its illumination. For example, a color which under normal light appears red turns to pink under a higher illumination; and, as this gains in intensity, the color fades until it is lost in light. If the amount of light falling upon the red be diminished, the color becomes darker until it is lost in gloom.

These phenomena may be imitated by substituting white for light and black for darkness. All tones of color containing white are called tints; those containing black, shades. The spectrum normal color is the standard, or key-tone. By arranging tints, standard, and shades in series according to degrees of intensity, a scale of color is produced. Each of the eighteen colors of the normal spectrum is the key-tone of a scale of colors, so that there are eighteen scales, each of which may be illustrated by a diagram like this:—

6	5	4	3	2	1		1	2	3	4	5	6
White	Very light tint	Still lighter tint	Lighter tint	Light tint	Tint	STANDARD	Shade	Dark shade	Darker shade	Still darker shade	Very dark shade	Black

For the sake of clearness and brevity these various tones are usually designated as follows: If the scale is red, the standard is indicated by R, the first tint at the left R_{t1}, second at the left R_{t2}, etc., to white; first shade at the right R_{s1}, second at the right R_{s2}, etc., to black. If the scale is orange red, the standard is OR, the tints OR_{t1}, OR_{t2}, etc., the shades OR_{s1}, OR_{s2}, etc. The eighteen standard colors and two tints and two shades of each with

the neutrals, white, silver, gray, black, and gold, serve to illustrate all harmonies of color.

Second, these colors may be classified according to their *composition*. Of the eighteen standards, six may be called *primaries*. Field called red, yellow, and blue the primary colors; but this cannot be true, for, while red and yellow pigments when mixed produce an orange color, they cannot produce the standard orange. Yellow and blue produce a green, but not the standard green. Red and blue produce purple, not violet. On the other hand, scientists say yellow cannot be a primary color, for it may be produced by mingling red and green

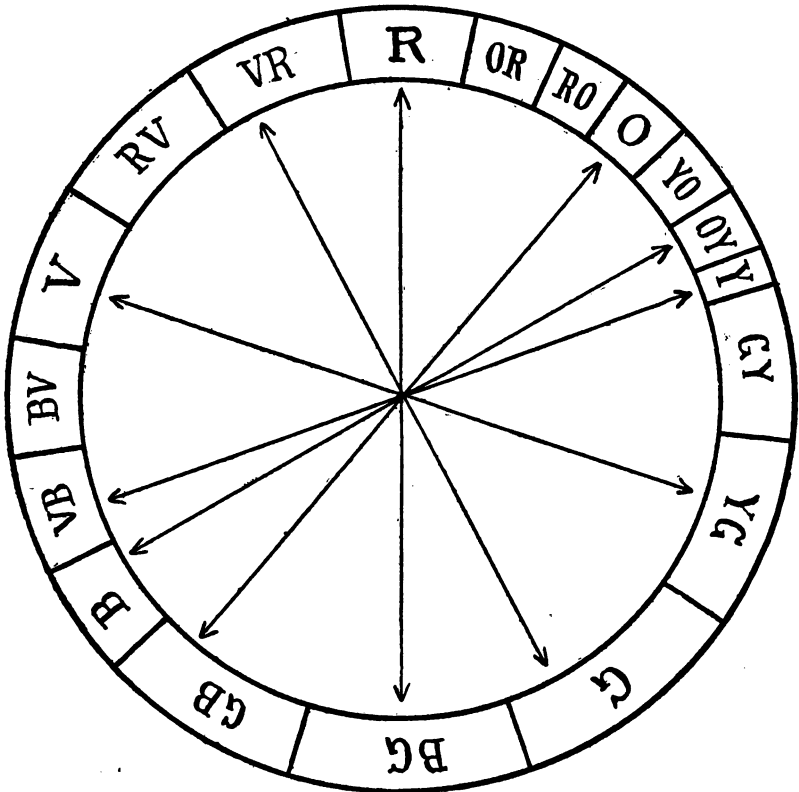


Fig. 2.

rays, and blue cannot be primary, for it may be produced by mingling green and violet rays, while green cannot be produced by mingling rays of light. So that, if there are primary colors, they must be red, green, and violet.

For practical purposes we must consider red, orange, yellow, green, blue, and violet to be the true primary colors; for the spectrum red is most closely imitated by madder, the orange by "orange mineral," the yellow by auramine, the green by Paris green,

the blue by artificial ultramarine, and the violet by mauve, a distillation from indigo, each a primary pigment,—that is, one not produced by mixing two other pigments.

The twelve intermediate hues may be produced by mingling the rays of light from disks * of these colors, and imitated by mixing pigments. They are therefore called *binary* colors. If now we arrange these eighteen colors in a circle, so that their angular distances correspond with their relative positions in the spectrum, a circuit is formed throughout which the colors harmoniously blend with one another without a break.† This circuit is called the spectrum standard circuit, and is illustrated by Figure 2.

By experiment it has been found that opposite colors in this circuit, when mingled, produce white (with the disks gray,—white under a low degree of illumination): these are therefore called complementary colors. Thus the complementary of red is blue green; of orange, green blue; of yellow, violet blue, etc. Only a few complementary pairs are indicated. By means of the disks the precise complementary of any hue may be accurately determined. And these experiments prove conclusively that three of the six standards are *not* complementary to the other three, but that each standard has for its complementary color a *hue*. The old “tertiary” colors of Field are but hues of the spectrum, modified by the addition of gray or black.

Third, these colors may be classified according to their *qualities*. Artists are accustomed to speak of colors as being “warm” or “cold.” The reds, oranges, and yellows are called warm because of the predominance of the colors of flame in their composition: the others are called cold, by way of contrast. The terms are merely relative, and are used to distinguish opposite colors in the circuit or to describe any single color. For example, Prussian blue is sometimes called a cold blue, and French blue a warm blue. Such uses of the terms indicate *natural* qualities of color; that is, qualities inherent in the colors themselves. But one color when juxtaposed to another often has a marked effect upon it. For example, an orange red wafer on a yellow ground approaches standard red in appearance, or orange tint on green approaches “salmon.” Colors thus acquire qualities from their neighbors, and are corrupted by the bad and qualified by the good, much as human beings are. Turner could by opposition get what color he liked out of brown, in some cases making it stand for purest *rose* light. These effects are understood by women of taste, who know almost intuitively what colors they can wear and what they must avoid. There are laws governing changes in quality produced by juxtaposition as invariable as the laws of matter, and these must be known before good coloring can be produced in art.

While pupils are thus gaining a knowledge of the spectrum, its parts and their relations, they should be exercised in producing combinations of colors exhibiting the application of derived principles. They will be guided to good results by closely studying Nature. In color, as in design, she is our most capable instructor, well versed in “methods,” infinite in resources, and, like other good teachers,

* Invented by Maxwell and perfected by Milton Bradley.

† The dividing lines in the circuit, as illustrated, are of course arbitrary, and only approximate the truth.

speaking in a still, small voice,—so still, indeed, that her words fall unheeded upon all ears but those made sensitive by love. By patient, humble study we may learn the secrets of her art, but never match her skill.

First, we may observe, she is frugal of full color. Her skies are pure blue only when clouds scatter after copious rain. Her foliage is never standard green. Occasionally she uses purest color at dawn, very rarely at evening. There are precious bits of it in minerals, in a few fruits and flowers, and for a moment in a drop of sun-lit dew; but she is lavish only with her tints and shades. In these she revels, defying all art with their subtle tones and changing values.

Secondly, let us remember that Nature has the advantage in combining colors; for, when she puts two colors together, she gets a pure resulting color, while our binaries at their best lose both purity and brilliancy. We may approach her effects by mingling rays of light reflected from colored disks.

Remembering these two facts, let us proceed to investigate Nature's coloring, to discover her harmonies.

Take the winter landscape first. We have a gray, cloudy sky overhead, a snow-covered earth below, the dark gray forest trees touched with white before us. This is a harmony of grays,—a *neutral* harmony. You will find this to be the harmony of steel and wood engravings, and in ornamental work well illustrated by Lewis Day in his "Anatomy of Pattern." Next, in early spring, we see a clear blue sky arched over the gray, faded earth,—one positive color with a neutral. A light fall of snow changes the gray to white; but then, when the sky clears, there is the same combination,—one color with a neutral. This is *contrasted* harmony. A little later some trees put out green leaves, and near by stands a maple with its crimson flowers. The brook, slipping through the gray meadow reflecting the blue above, is edged with golden "cowslips." We find these to be *complementary* harmonies. In May the old pines are blue green, the fresh grass and leaves of elm green, and the rock maple and willow yellow green. The plants in the meadow show the same colors side by side; and so Nature runs into an *analogous* harmony, taking tones from scales closely related in the spectrum. In August the greens have reached maturity, many bright flowers have gone, the sky is hazy,—no longer blue, but gray. The principal harmony now is *dominant*, one color, green, with its tints and shades.

But soon Nature begins to retrace her steps. Some leaves begin to fade and turn yellow, others hold green; and these, with the old pines, complete the analogous harmony again. Later the maple is complementary to the pine, the ash, cherry, and chestnut on the hills complement the sky; the asters, the goldenrod; while, to match the olive of October's fields, the oak presents his rich maroon.

"November's fields are bleak and sere," the leaves are dead, and the gray earth contrasts with the blue sky again, until winter resumes her neutral harmonies.

So you see Nature oscillates through these five harmonies continually, occasionally giving us in each season days of *perfected* harmony, making six harmonies in all:—

Neutral,—white, black, gray.

Contrasted,—one color with a neutral.

Complementary,—opposite colors in the spectrum circuit.

Analogous,—tones from neighboring scales.

Dominant,—tints, standards, and shades of one color.

Perfected,—usually analogous or dominant, with complementary hues.

"But," some one objects, "those are so very general. You can't prove anything by taking nature at random. Don't you ever find green hills against blue sky?" Yes: but the sky isn't *blue*. Next the horizon it is gray, and green and gray form contrasted harmony. "How about the combination when you look up through a green tree and see the sky beyond?" Well, next summer, as you lie in a hammock under a tree, if you will take pains to notice, you will find that the warm sunlight streaming down through the leaves changes them to yellow green, and that the sky is not pure cold blue overhead. There is enough yellow in the leaf to match the blue of the sky, and enough violet in the sky to match the green in the leaf, so that the combination becomes endurable.

"Well, but I've seen a hill brought against the ocean, in a landscape!" Yes, and, if you viewed it from a distance under full sunlight, the hill appeared dull *yellowish* green, complementary to the violet blue ocean; and if at short range a band of orange sand or a bed of orange rocks separated the two (orange containing red for the grass and yellow for the water, you see), and if you find a place where the grass grows to the very brink, as you look down you see through the grass to the reddish brown earth, and into the water to the greenish bottom, giving you complementary hues again.

"How about the sky?" somebody asks. At noon white clouds, if any, on blue (contrasted harmony). Look later, and the sky has changed to golden in the west. But the clouds are no longer white: they've changed to blue gray (complementary). If the sky flushes to scarlet, the clouds change to a deep scarlet shade, or, if not, are edged with gold, a neutral color for separation. Sometimes the sky is green yellow, but it only serves as a background for violet clouds (complementary again). In early morning the sky runs from yellow at the horizon through gray to blue (not through green*), with orange streaks of cloud below and violet above (two analogous harmonies blended into one).

And so one might go on infinitely, almost; but he would never catch Nature napping.

Think of trees a moment. The trunks of the deciduous are a neutral gray (with the leaves making contrasted harmony), while those of cedar and pine are colored a little to hint at a complementary or an analogous color for the perpetual dull green. And, even after the needles have fallen, they do not turn a dead gray under the snow, as do leaves; but they turn to a rich warm brown, to harmonize with trunk and boughs above.

But let us turn to the flowers for a moment. Here we must at once distinguish between cultivated and wild flowers. Rousseau says in "Emile," "Coming from the hand of the Author of all things, everything is good: in the hand of man, everything degenerates." When

* How this is made possible may be illustrated beautifully with the disks.

man begins to cross the flowers for new varieties, he usually makes a mess of the color. For instance, think of the colors in a fuchsia,—flesh color, fearful purple and pink, with yellow-tipped stamens,—of the magenta petunias and the russet pansies on their yellow-green stems! In wild flowers you find no such combinations. Run over the list of spring flowers,—they are mostly in complementary harmony,—violets, rhodora, crane's-bill, meadow-beauty, all ranging between violet and violet red, with yellow greens for leaves. The "cowslip," taken by itself, is an analogous harmony, the anemone a contrasted, the club moss a perfected, the gray lichens on the old walls an analogous, and a patch of old cedar trunk, with its vegetation, a perfected harmony. One of my favorite plants, the marsh St. John's-wort, has a flower the tint of orange. But Nature manages that; for, while near the foot of the stalk the leaves are yellow green, gradually changing to green, they grow deeper in color as they ascend until when they cluster about the head to protect the little flower they are, because of peculiar texture, bluish, and in their leafy cup receive the delicate flesh-colored flower with its specks of pure orange anthers.

Do you see now why flowers look best on a ground of their own leaves? Every flower has a leaf especially designed to set off its beauty to best advantage.

Leaving Nature's combinations to investigate the coloring in the arts, we find the same six harmonies prevailing. The savage, as he incised his rude ornament on his clay bowl, produced neutral harmony. Later, when he added color, he made a contrasted harmony. The Persians delight in complementaries. Von Bezold describes one of their rugs done in two pairs of complementary colors with gold. The Egyptians used complementary colors. If you will go to the Museum of Fine Arts, you will find "Mummy 959" decorated in orange and green blue, and "Mummy 956" in red and blue green (perfect complementaries). The Greeks had two schemes of color: For vases, analogous harmony, using yellow tint, orange-yellow and orange-red shade, or yellow-orange shade, red-orange tint and orange-red shade, as may be seen in the Greek Room at the Museum. In sculpture and in architecture they used such colors as would produce complementary and perfected harmonies. Pompeian coloring is contrasted, principally, although occasionally you find an exquisite perfected harmony.

Hebrew, Saracenic, and Gothic art is based largely upon what Ruskin has called the "sacred chord of perfect color,"—blue, purple, and scarlet, with white and gold,—although in the Alhambra the blue and scarlet of the upper walls blending to produce the purple are complemented by the green, gray, and yellow mingled in the dado to make yellow green, the whole producing a perfected harmony of unrivalled richness. I suppose the Saracenic Moors were, of all historic builders, the most perfect colorists.

Modern decorative art runs largely to dominant harmonies, perhaps because the average decorative artist finds that he makes fewer mistakes in this than in others. But the last few years have seen great improvement in coloring, and the next few will see more.

All these facts of color and of color combinations may be *taught*; and girls will dress in better taste and boys will paint their houses more

harmoniously when they "come to the estate." This suggests that the teaching of color has a utilitarian value. It reveals color-blindness and helps a boy choose his occupation. It enables him to become proficient in designing or dyeing or frescoing or painting or in a score of other trades. But, aside from all this, it seems to me to be chiefly valuable as a means for bringing the individual into correspondence with the two worlds of which mention was made at the beginning. Everybody loves color. Fred Ames has his million-dollar greenhouse in Easton for the sake of it; and in the wretchedest den in this city you will find a tomato-can with its little scarlet geranium. And God has flooded the world with color for us to see and love. But how few of us ever give it attention!

Let us teach the children to read the manuscript of nature re-illuminated every spring: to watch the sky refrescoed daily by divine artists, and then, perhaps, we may lead them to that higher plane where Emerson stood when he wrote,—

"'Tis not in the high stars alone,
Nor in the cups of budding flowers,
Nor in the redbreast's mellow tone,
Nor in the bow that smiles in showers;
But in the mud and scum of things
There alway, alway, something sings."

He stood where the Preacher did when he exclaimed, "He hath made *everything* beautiful *in its time*." There is, then, beauty for us to discover in the commonplace and the unattractive; and even the ugly has a supreme moment when it is clothed with beauty as with a garment. Turner knew this moment, and always seized upon it for a picture.

We see some old, broken trees by a neglected wall upon a hillside some day in March. They have no beauty. But some quiet evening in April the heavy, gray clouds in the west lift just as the sun comes to the horizon, he pours his glory through the mists of the valley and changes them to purple, he melts the clouds above into crimson. The old trees feel that their moment has come at last, and they stretch up their black arms across the west and throw their long shadows down the hill, and, as you look, you say, "Ah, this is a picture!"

Here is an ugly bramble by the wayside. Has *it* a supreme moment? Wait and see. There was a light fall of snow last night; and this morning each zigzag stem bears its dainty line of white, each thorn has caught its little tuft, and under each hides a spot of moistened green, and the early sun bathes all in rosy light.

"How great are thy works, O Lord! Thy thoughts are very deep. A brutish man knoweth not; neither doth a fool understand this."

Now it seems to me that our chief business is to teach "fools" to "understand,"—to open blind eyes, unstop deaf ears, and make the tongue of the dumb sing.

I said in beginning that color forms a part of two worlds. I should have said of *three*. (For there is another that we think of occasionally when we are weary of these.) If you will turn to Revelation some time and read what John saw in his vision, you will realize that in

teaching the child to know the beauties of the earthly you are only preparing him for the glories of the heavenly.

John says he saw streets of gold, but in the next breath he adds "like unto transparent glass,"—taking away substance and leaving color. He saw One seated on a throne so radiant that the only words to describe his beauty were "like unto a jasper and a sardine stone. And there was a rainbow round about the throne in sight like an emerald." Notice the coloring. And John saw breastplates and swords; but they had color only, for they were transparent and ruddy "like a flame of fire." And he saw a city that had foundations of fair colors, so pure, so brilliant, that he could think of nothing with which to compare them but the rarest gems of earth,—jasper and sapphire and beryl and the rest,—twelve in all; and, if you will make these a study, you will find that they correspond to the six colors of the solar spectrum and their six complementaries. These combined on earth produce pure white; but John says that, when combined in heaven, their light is "like unto a stone most precious, clear as crystal, having the glory of God."

DISCUSSION.

JOHN S. CLARK, of the Prang Educational Company.—I have been greatly interested in the paper that has just been read, for it presents the subject of color as a very important feature of public education. We are just beginning to recognize that color is, in fact, an element of great weight and significance in the mental development of children. I think the general subject needs no stronger presentation than that which has been made to you this morning.

Now if we consider, as the speaker suggested, how full nature is of color, if we realize how important a right understanding of this color is in man's art, we cannot help feeling that we approach one of the fundamental questions in education. How can we lead the child to appreciate that which we ourselves appreciate? How can we reach and develop his imperfect color-sense? How are we to deal with this opening problem in our schools? I believe that a great many valuable suggestions in regard to this practical aspect of the matter will come to us from those who are now experimentally at work on the problem in the schools. Actual experience, as wide experience as possible, in dealing with the children, is what we need as a basis for our plans of color-instruction. No mere theory of color-instruction is worth much.

I have been profoundly interested in some recent experiments in regard to what children see of color. We are too apt to imagine because we see and enjoy certain color-effects that the child must see and enjoy them, too. But the fact seems to be that young children do not see color as we see it. We are finding that the child's color-sense is just as much a matter of growth and development, just as much a subject for systematic cultivation, as any other natural faculty. Experiments lately made in the Somerville schools have been particularly significant, as showing what little children see in the spectrum colors. It is strikingly evident that the range of colors which little children can distinguish and enjoy is quite different from what we have usually assumed it to be.

It seems to me absolutely necessary that we get as broad a basis as possible of direct, experimental observation of children in regard to the manner and extent of their appreciation of color, in order to formulate any sound course of color-instruction for our schools. When once we know what the child's color-perceptions are at the outset, then we certainly can do a great deal, through proper exercises, both of color-observation and color-expression, to develop the color-sense with which he started, and to insure that, as his general mental strength grows, his appreciation of color shall grow also.

But Mrs. Hicks, who is present this morning, has in her mind, I know, those experiments made in Somerville to which I have already referred. If she will give us some account of them, I know it will be of interest.

MRS. MARY DANA HICKS, Director of Prang's Normal Drawing Classes.—I have not with me the figures which will tell you the result of experiments of which Mr. Clark speaks, but I can tell you the nature of the experiments. For a long time this color-question has been under consideration, and the manner of best reaching it in the schools.

Preyer is probably the one who has made the most extended observations on the color-sense of children, or rather upon that of his own child, whom he observed every day carefully. He also recorded a few other cases in his book, "*Die Seele des Kindes*," or "*The Mind of the Child*," as the title is in the English translation. He records these observations in full. One of the most remarkable statements I may quote you is this: the child would select red and yellow and orange, but, when he was tested on blue and green, he said, "I cannot tell the difference grown people can." He was not very old then,—between two and three years.

In preparing for any course of instruction in color, it becomes necessary to study all these previous experiments, and to make any other that may seem to come in play. The experiment at Somerville was this: A class of between twenty and thirty children were taken in the first grade. They were what are called September children. They were provided with oblong sheets of drab card-board, and also provided with twelve oblong tablets, two inches by one-half inch, of twelve spectrum colors, the six leading colors and the intermediate hues,—red, red orange, orange, yellow orange, yellow, yellow green, green, blue green, blue, blue violet, violet, red violet. The children were asked to spread those tablets around on their sheet. They were carefully dissuaded from any regular order. Then, before they had a very long opportunity to look, so as to get their first perception as nearly as possible, the teacher asked each to hold up the color she liked best. Each one was ready very quickly. Then that tablet was deposited in the groove of the desk, and they were told to arrange the remaining tablets as they pleased on the drab paper. While the children were thus occupied, the record was taken of the colors preferred. The same experiment was repeated in four or five other classes,—one of the same grade, one of the second year, and one of the third year. The colors preferred were all at the left end of the spectrum. It may surprise you to know that, out of two or three hundred children examined, there were not more than a dozen who

took red. The colors chosen ranged between red orange and yellow green, yellow green coming in for its full share. They liked the yellow green as well as they did any of the other colors. The red orange was a favorite, but the choice lay mainly between red orange, orange, yellow orange, yellow, and yellow green. That was the result of one experiment.

The succeeding experiment was different in character. A spectrum chart of twelve colors was hung before them. The tablets were given to them again. They were asked without further direction to lay the tablets so that they looked as they did upon the chart. In the first class examined, of about twenty-eight children, two laid them correctly, but a dozen laid them promiscuously in any order. This mixing of colors did not trouble them at all. The most of them laid the spectrum correctly from red through orange to yellow green. Then they seemed to fail. There was one very interesting case, in which the little girl laid her spectrum correctly except one tablet. About ten minutes were given to the children, but she had hers arranged very quickly. Her spectrum was arranged well in the middle of her card, but off at one side lay pathetically the blue-green tablet. She could find no place for it. No remark was made to her. I glanced every now and then to see if it had any place. No, she could find none. There was another case in which the colors were laid correctly; but the tablets were laid so that the long edges were from left to right, instead of from top to bottom, as upon the chart. That did not seem to disturb the boy in the least. This experiment was repeated in several other classes, enough to show that the children see the difference between the hues in the left end of the spectrum, but that the right end appeals to them with but very little power. This is affirmed by experiments with older persons. A superintendent said, "It was not very long ago that I could not tell the difference between blue and green." So these experiments lead us to feel that we have to build, not upon the supposition that children see colors as we see them, but that we have to learn what they see, and then pass from the known to the unknown.

A paper on "The Language of Form" was read by Col. Charles W. Larned, U.S.A., Instructor in Drawing at West Point Military Academy.

THE LANGUAGE OF FORM.

BY COL. CHARLES W. LARNED.

The invitation to address you, which I have accepted with much pleasure and misgiving, was a double surprise. My guild is not one from which the arts of peace are apt to seek counsel, and I am not aware of having done anything in or out of it which would entitle me to the consideration of your attention. The point of view in the discussion of the topic may of course be taken from any location on the social horizon; and it is generally assumed that the positions in azimuth of the civilian and the soldier vary by one hundred and eighty degrees; so that, in seeking the opinion of one who since the age of sixteen has thought to the sound of the drum and bugle, I

fear you are flying in the face both of tradition and discretion. While I shall do my best to negative the force of such an assumption in the present instance, I am not at all sure that the judgment of a man whose habits of life and thought have been trained in the school of military precision and uniformity, and whose attitude toward all social questions is that of an outsider rather than a participant, will be of much practical value in the school of industrial flexibility and variety. If I succeed, it may be for the reason that through all variety there runs the binding law of uniformity, and that flexibility without the restraint of precision is apt to become flimsiness and vacillation.

I am asked to speak upon "The Language of Form," which is a phrase I have ventured to apply to the whole range of industrial graphics,—an art whose limits and principles have of late years become well defined, and to which the material enjoyment and well-being of the modern world are tributary in a degree it is learning to recognize somewhat slowly, but none the less surely. But, before pressing to the pith of my subject, may I be permitted to congratulate you upon the power and earnestness of the movement for industrial education which you are here to represent, and to express my own conviction, as one who for many years has been a deeply interested observer of the working of the social forces of the century, that manual training in its fullest meaning is no fad or folly, but one of the first and worthiest evidences of the growing recognition of the brotherhood of men, and the community of their rights in the beauty of that universe which is their common heritage? It is a movement which has behind it the cry of the great host of manual toilers for their birthright as men,—equality in the enjoyment of the free gifts of God, and a share in the "sweetness and light" which have been so long reserved to the apostles of culture and the *illuminati* of privileged circles. It has also behind it something perhaps more practically potent, which is the interests of manufacturing communities and the great industries of civilized peoples. Nothing seems surer than that in the race for industrial supremacy that nation will be the winner whose industrial classes are best educated, and in which the craftsman has attained the highest grade of independent, intelligent self-reliance and self-respect. Perhaps I may say one thing only is surer. It is this: that such a nation has the most certain foundation for social stability and domestic peace. To fail to educate the manual toiler in his toil; to neglect to give him a pleasure instead of a hate in the work for his daily bread, that he may rejoice in living and doing; and to refuse to open his mind to the light the Divine Goodness has shed upon his works,—is not only to rob him of his physical, but of his spiritual inheritance, to foster the evil passions of both natures, and deliberately to invite the war of class against class in a struggle for vengeance and spoliation. The very lowest motive of self-interest would seem to suffice for the apprehension of this open secret, if no sense of pity and justice availed to move the comfortable and well-to-do, to whom art and the slaves of its industries bring their choicest works. No effort of charity, however benevolent and far-reaching, is of such importance to the well-being of this great host of our fellow-men as their education in their toil,—the lifting up of their labor

into the light and sunshine of intelligence. It is this purpose which I understand the movement for industrial education to represent, the workings of which you are here to discuss, and upon whose success depends so much to ourselves and our descendants that I feel it a privilege to be allowed to contribute my trifle to the great cause.

May I express the hope that this movement will always be guided by sound judgment and logical methods, and that its energy may not be dissipated by unwise experimentation in ill-digested theories and psychological fancies? Unity of purpose and action; carefully considered legislation,—for this matter is a right, not a charity; fidelity to the highest principles of art and morals; and a coherent system,—are, I conceive, the foundations of success. It is most true that no worthy national art has fallen a palladium from the sky, but instead has grown upward from the people through their race and religious instinct. The people must be behind an art to make it national and great; and, though wealth may foster and encourage, it cannot create it, nor can museums or exhibitions do more than modify and temper its character and stimulate its endeavor. The life and growth must have their roots in the beliefs, the pleasures and aspirations of the people, so that in this education which is directed to the ennobling of their labor and the enlightenment of their perceptions you are nourishing the true outgrowth from which must come what is most worthy in future development.

In discussing the claims of the study of form and the methods of its graphical expression to be considered as an important element in any scheme of general education, I cannot preface the subject better than by recalling the remarks of Professor Huxley in his address to the Workingmen's Club, delivered some years ago, on the subject of Technical Education. He said,—

“And especially I should require some ability to draw. I do not mean artistically,—for that is a gift which may be cultivated, but cannot be learned,—but with fair accuracy.”

In his inaugural address as Lord Rector of Aberdeen, he also says: “But the man who is all morality and intellect, although he may be good and even great, is, after all, only half a man. . . . In the mass of mankind the æsthetic faculty, like the reasoning power and the moral sense, needs to be roused, directed, and cultivated; and I know not why the development of that side of his nature through which man has access to a perennial spring of ennobling pleasure should be omitted from any comprehensive scheme of university education. . . . I should like to see Professors of the Fine Arts in every university, and instruction in some branch of their work made a part of the Arts Curriculum.”

These extracts give a brief presentation of the claims of the study of the expression of form from two points of view—the technical and the æsthetic—by a clear and close reasoner, a broad as well as a practical student of the problems of education, who stands squarely on the platform of science and utilitarianism. I say presentation: they are, in point of fact, hardly more than allusions; and yet, considering the man and the occasions, there is much therein that is significant, and more implied. They will serve, therefore, as a text for the development of some further considerations, based upon the

following convictions, which are the result of my own experience : 1st, that the study and graphical expression of form is in nature and in possibility of achievement for the laity upon the same general footing as other branches of systematic education ; 2d, that in educational importance as a factor of mental discipline it is second to but few studies of the general curriculum of our schools and universities ; 3d, that in broadening and refining effect upon the intelligence and in the opening of arenas for æsthetic development it has no superior among primary studies ; 4th, that in practical utility and universality of application it has few equals, perhaps none. These convictions are based in turn upon a personal experience of seventeen years' continuous work in the instruction of young men recruited from every walk in life, but principally from the middle and hand-working classes ; from every section of the country ; from nearly all of the nationalities composing our social body ; with greatly varying degrees of general intelligence ; and, I think I am safe in saying, without any previous graphical training whatever in over ninety per cent. of the one thousand and sixty-one students each one of whom has come under my personal supervision, not only in my own course of instruction, but as a member of the governing and examining body of the Military Academy in the entire course of studies composing the curriculum of that institution. During this period I have closely observed the phenomena of formal apprehension in what may be called the average mind ; and the propositions I have enunciated are deliberate, and the result, I believe, of exceptional opportunities of study and comparison, under conditions of control not to be obtained elsewhere. At the Military Academy every cadet is required to complete and be pronounced proficient in every study of the course in its entirety, so that no account is taken of individual aptitude for special branches. It will be seen, therefore, that the opportunities for comparison under average conditions are, as I have said, exceptional, and that the development of the individual in subjects independent of natural aptitude is carried as far as education, re-enforced by powerful personal motive and discipline, can go.

Whatever prejudices are to be overcome before achieving the acceptance of these principles, in whole or in part, there will be none more difficult to deal with than those which arise from the twofold source of tradition and of ignorance of the subject. Of the two, the former is the more obstinate. The latter yields to investigation and enlightenment, but the prejudices of tradition die hard. As regards the second, it is difficult, however, to address one's self to those who lack rudimentary apprehension of the subject under discussion. Men who have "got along very well" without a special accomplishment, and have neither practical nor theoretical acquaintancé with its difficulties, its effects, or special uses, are very apt to look upon it with indifference or disdain. Their development along particular lines is all-sufficient, and what they do not understand loses in importance in direct proportion to their ignorance of it. This sort of prejudice is by no means confined to weak or untrained minds. I am inclined to think it stronger and more obstinate in minds which have a bias in particular directions, or which have received a high but one-sided development. I have known many able and excellent men who

regarded literature as an amusing intellectual weakness, art as a rather trivial eccentricity, history as rubbish, law as hair-splitting, and so on, including in the category of their contempt or indifference every subject with which their training and mental habits had not brought them into contact.

It is a very strange fact that education since the Revival, in which the Greek influence has preponderated in many departments of thought and most forms of art, should have concerned itself so little with Greek methods of training. Since the humanists heralded in the streets of Padua and Bologna the new avatar of Pallas Athene down to this latter day, her cult has been supreme in academic halls, but her methods have been generally ignored. A race of men the most intellectually subtle and the most artistically sensitive of all time, whose development was founded on physical culture, and with whom the acme of attainment was the skilled discipline of the faculties, has dominated the philosophy and art of more than twenty centuries, which, while copying and extolling this civilization, have never sought the road by which it was attained.

But the breezes of revolution are rustling through the dead leaves in many an academy; and the demand of the young world of thought is for an education that educates, that feeds the mind with the food of activity,—not the narcotic of dreams and speculation; that trains the physical faculties, making them skilful to perceive and to do; that prepares the intelligence for the great world problems of to-day and to-morrow; that gives bread, and not a stone,—the genius of vital intellectual growth, and not the mummy of withered achievements.

There are altogether too few men in the world who are skilful to do with their hands,—not to talk or to write or to imitate, but to perform with skilled faculties. The eye of that much traduced creature, the average man, is becoming more and more dull and indiscriminating, the hand increasingly unapt and inexpert. The more machinery and the artificialities of life relieve the individual of the responsibilities of physical action, the more the faculties will suffer from atrophy, for the reign of the machine has a dulling effect upon the general acuteness of the physical faculties, that must be progressively felt unless education systematically counteracts its influence; and it is the function of industrial training to do this work for the hand-worker, while general art education should carry it forward for all.

The study of form underlies all art, and no art that rejects it can live—although a few color impressionists seem to think the contrary. The delineation of form is its written language; the study of it is the foundation of all achievement in its expression; and he who neglects it is illiterate in art.

In my presentation of this subject to-day, I shall ask your consideration of some broad general principles which underlie it as a science rather than an art, since it is the general application of it to the laity that interests us rather than its apprehension by the specially gifted few.

The First Principle I shall enunciate is that the development of formal perception is both a Subjective and an Objective process. It involves two organs and four faculties. The organs are the Eye

and the Hand; the faculties, Apprehension, Judgment, Memory, Sensibility.

In the operation by which an observed form is produced pictorially, the function of the Eye is passive. It is the channel through which intelligence is communicated both ways; first, to the faculties which operate and inform the will: second, as an assistant to the will in the guidance of the operations of the hand. The active agents throughout are the faculties and the hand. When keenness and quickness of eye are spoken of, it is really judgment and apprehension that are meant. Firmness, precision, flexibility, rapidity of execution, reside in the hand. Training of the eye, so called, is a misnomer. The eye is really trained not at all, or very little.

This point is important for from the moment we recognize the fact that we are dealing with qualities of the mind and manual skill the method of development becomes a logical and practical system. When the faculties which operate are defined and their functions understood, the processes required for their development can be intelligently analyzed. To the four faculties named above can, I believe, be traced all of the subjective phenomena of perceptive vision. I have already analyzed in a short paper prepared for the *Cosmopolitan* their operations, and time does not now permit that I should much enlarge upon that analysis. What I wish to emphasize is the fact that their training opens at once into a broad field,—a field much broader than is generally included in the study of formal expression.

In the first place, the training leads to an intelligent determination of the personal equation by practical tests. In the second place, it leads to the conscious development of these faculties by methods other than objective copying, through which each one of them is stimulated and directed. Practice can greatly improve the power of Apprehension; that is, a greater number of images will be consciously recognized after the attention has been trained and stimulated than in the normal state. Houdin, the prestidigitator, acquired by constant practice the power of taking in an incredible number of objects at a glance, so that in passing a shop window he was enabled with a single sweep of the eye to see and note almost everything in it.

Similarly, the formal Memory is surprisingly susceptible of improvement by discipline; and, in his feats of description, Houdin had cultivated this faculty also to a wonderful degree. My own experiments in this direction lead me to believe that its development by progressive stages is easy and certain in nearly every case, and that nothing contributes more powerfully to habits of conscious attention, or to overcome the habit so general of passive slovenly vision, than memory drawing and descriptive memoir. I desire to insist upon the adjunct of descriptive memoir, or some form of verbal descriptive analysis, confined not to a single object or group of objects, but to include a landscape or a tour of observation. The memorizing of a single object does not bring into play a sufficient number of general relations. It isolates the consciousness too much, and prevents that large intelligent grasp which brings formal study into the scheme of general intellectual development, and enlarges the power and habit of accurate and retentive observation.

The Judgment is the faculty that operates most actively in the translation of form. The Apprehension presents it to the Judgment, the Judgment in turn presents it to the will, the Will transmits its conclusions as mandates to the Hand, which then executes in proportion to its excellence as an instrument. The Judgment compares, discriminates, decides. It is educated by tentative processes often repeated. It is, therefore, in practical work logically progressive that its education will be best accomplished. The great error lies in attempting to train it by the illogical method of copying the completed process of another's judgment, as is the case in all drawing-book systems. The very function which is to be developed—*i.e.*, that of translating relations from actuality to a plane surface—is here ignored; and the task given is of a totally different character, being simply the comparison of equalities on a plane surface. The flat is only to be used for special purposes, those of illustration and method. As a discipline, it is both useless and pernicious. As an illustration of method, it has important and well-recognized functions; and the most expert genius does not disdain to copy the work of other masters. In the early development of the Judgment, use verbal analysis constantly. Pursue the refractory faculty into its sluggish lair and drag it forth. Insist upon intelligent perception of relations and a clear verbal explanation of them. Let the students bring their libels to the judgment-seat, and, with the model in view, make them their own accusers.

Sensibility embraces all the higher and more delicate sentiments and relations which ramify throughout the personal consciousness, and whose filaments penetrate into the remotest corners of sentient being. All the subtleties of thought and emotion reside in it, and its bounds are as elastic as its principles are elusive and evanescent. It is pre-eminently the faculty of Fine Art, the transcendent faculty,—this eye of the soul that looks upon the harmonies of two worlds. In some it is almost lacking, although I doubt if the most prosaic or debased are wholly without it. It has, I think, an active and a passive part. The one cannot be created, developed, or meddled with in any way. You cannot develop an A minor symphony, or a polonaise of Chopin out of the study of acoustics and thorough bass; nor an "Inferno," or an "Ancient Mariner" out of the elements of rhetoric and study of literature; but you may develop an appreciative listener and an intelligent reader by the aid of these processes, which is doing a very great deal. It is the passive or appreciative side of sensibility, therefore, that responds to education; and the logical inference is that the study of form language should be accompanied by constant and intelligent æsthetic criticism and analysis. Teach the eye to dwell on the beautiful and reprobate the ugly, and to know the difference.

Now a word regarding the executive organ, the supple, skilful, obedient servant of the will,—the Hand. It is to be observed that the skill of the Hand in many of its operations is involved with and dependent upon that of the arm. In any systematic course of education the activity of the arm would be developed in connection with the larger members before that of the hand, and the training of the latter would proceed upon the basis of firm muscular power, suppleness, steadiness, and obedience in the former. Giotto's arm and

wrist drew the circle. Something, of course, depends upon physical conformation, as with the eye. It is an advantage to possess a hand having long, finely rounded fingers and a muscular body; but many of the most expert perform their wonders with stubby fingers, and with bodies originally weakly formed. I have seen women perform prodigies of dexterity and strength on the piano with hands which, even at the time, appeared frail and delicate, and men with stubby fingers among the most brilliant of *virtuosi* in technique.

With the Hand we find a process of development different from that of the eye. Although Bell, in his beautiful monograph on it, says, "The motions of the Eye are made perfect, like those of the hand, by slow degrees," it will be observed that it is the muscular activity of the Eye controlling its searching power which is spoken of; and, however important the searching power may be, the analogy there ceases. The analogy does not strictly hold even in that particular, for the development of muscular activity and of perfection of automatic action is much more rapid in the Eye. Again, the modes of the Hand are *movement* and *touch*: it has no mode corresponding to the automatic adjustment in the photographic action of the Eye. The principal movements of the hand and arm in drawing are the motion of the radius on the ulna, in controlling the wrist motion, and those of the metacarpal muscles, controlling the expansion and contraction of the fingers. The general movement of the humerus on the scapula, carrying with it the forearm, is more rare in drawing on a nearly horizontal surface, but constant in easel work. The thorough control of these movements requires constant practice. The use of the hand as an instrument begins by comparatively slow conscious effort, and it matures its functions gradually. It is a tentative process. With the Eye, other things being equal, its first performance after physical maturity is as perfect as its last. The first training should be a general one, to give flexibility, strength, and obedience to the muscles. That acquired, the eye and mind are not hampered by a stiff, tremulous, incoherent, or non-responsive tendency in their tool. Note that half of the time at first employed in drawing or other skilled labor involving the hand is taken up in overcoming mere general physical deficiencies, which should have been remedied beforehand. Therefore, this much time and effort are wasted, so far as it is intended to be employed in the acquirement of skill. Often this weakness and awkwardness will negative all other effort, and paralyze all operations of the mind, in spite of continued special practice. It is like trying to teach a man on crutches to make a flying leap by showing how the thing is done. The infirmity is so great that isolated effort cannot overcome it.

From the foregoing it will, I think, be admitted that a logical system of training in the language of form involves much beside objective explanation and the exercise of copying form. A conscientious draughtsman, whose skill is purely mechanical, and has resulted only from the continuous drudgery of copying models, has attained only a small part of the development which a real art education should give. His powers of observation, comparison, relation, in their general influence upon his intellectual operations, may be but feebly stimulated. He is little more than a copying machine,—a sort of human camera.

The foundation work must begin with the child in the kindergarten and the primary school,—yes, back of that, in the nursery and under the parent's eye. It is only the civilized parent who neglects the personal training of his child. Stimulate the formal consciousness in every possible way,—by explanation, by interrogation, by encouragement of verbal description, by simple analysis. Exercise, also, the hand and the arm, as the great executive agents, in every way that will render them supple and exact, responsive to the will in every movement,—not in one or two only, as is usual, but ambi-dextrous in every sense.

To recapitulate, I hold that in education the training of the physical organs should precede, and accompany at certain periods, the training of the intellect; that every individual should be taught the skilled use of every member, and the mental faculties associated with its employment; that the study and interpretation of form, both plastic and graphic, involving the Eye and Hand, are the most important branches of this training, and affect all the operations of the mind depending upon concrete conceptions; that graphical instructions involve vastly more than is understood generally by Drawing; that, if the individual is taken in childhood and rationally and systematically trained in formal Apprehension, Memory, Judgment, and Definition, not only will graphical skill be attained in a degree depending largely upon intelligence, but that clearness and closeness of observation, precision of mental conception, vividness and accuracy of description, and wealth of mental imagery will result in the same degree; that in its practical aspect the power to delineate and to interpret delineation is an acquirement which has its application in the scientific and industrial professions without exception; and that in its æsthetic relation the knowledge of form involves all of our surroundings and many of our higher enjoyments.

The Second Principle I propose is that the alphabet of the form language is Geometry, and that no sound education can be given in the art of its expression which is not based upon at least a good knowledge of the laws of the relations of magnitudes.

In industrial art this is too obvious to need demonstration. The whole range of mechanical arts is built upon it, and in the decorative arts Geometry is the warp upon which the woof of design is wrought. These laws are the eternal and inexorable edicts upon which the harmony of the universe is established, and they cannot be ignored. In all the constructive industries the knowledge of them is the power that creates, and without this power the enormous productivity of the age would be impossible.

But in free and fine art it is generally supposed that geometric laws have no place. On Parnassus Geometry is only a scullery maid in the estimation of many who should know better; and so some otherwise great artists are obliged to call in the aid of a great architect to draw their buildings and determine their lights and shadows for them, to inform them whether a portion of their work is or is not a silly libel on truth. They are illiterate geniuses in so far as they do not know the alphabet of form.

The earliest training in free-hand work should begin with the simple geometrical solids and a consideration of their elementary pro-

portions and perspective relations through increasing degrees of difficulty until they merge into the complex forms of organic life. The structural organism of natural forms will always be better understood and more quickly recognized under such a progressive system.

The Third Principle is that Form Language is a Conventionalism. In its highest expression in fine art it is never literal, even where its aim is such. The nature of its media renders literalism impossible: there must always be a compromise. As we descend the scale from the fine to the practical arts, the conventional character of the symbolism steadily increases until we reach the statistical diagram and census chart. The consideration that follows from this principle has regard to the degree and character of convention that shall best express the objective truth. In any given case, what shall be given and what omitted? This consideration involves one of the highest and most important effects of formal study upon the general intellectual development. I mean the Power of Discrimination, the ability to perceive readily and translate clearly the typical character in any object. It is the power that makes great reasoning and great men in the intellectual sense, the ability to see through and beyond the tangle of confusing details—the accidents of surface—to the type idea, and to express it in its clearest relations.

In the training of the formal perceptions this great truth should never for one instant be lost sight of. It is the *great criticism*, and true progress must always be determined by its standard. No amount of dexterity, of technical cleverness in detail, can compensate for the lack of this power; and no amount of time and patience is too great to attain it.

As an instance of this Conventionalism of Form Language, we have the line. If we examine the circumstances of illumination of a body, we shall deduce several well-defined laws of light and shade. By assuming this body, first a cube and then a sphere, suspended in space, transparent or opaque, polished or roughened, and illuminated from a single source either at a finite or infinite distance, the eye of the observer being assumed at different positions, we can discuss most of its phenomena of light and shade, thus isolated. If now to the above conditions be added that of a refractive, luminous medium like the atmosphere, the results approach a step nearer the appearance of such a body under natural conditions. Let a single horizontal surface be brought into the conditions, and we shall have located the body on the surface of the earth, at which point the discussion can be complicated as much as is found profitable by the introduction of proximate reflecting surfaces, vertical or oblique. We shall find as a consequence of such a discussion that our *perception of form* results from the degree of its illumination and the ratio of its light and shade, and that this is *absolutely* the only *visual* criterion. Varying degree of contrast of illumination, therefore, is the phenomenon by which form is made known to us through the eye, and in form the line nowhere exists. Yet in art the line is the universal agent by which we render form graphically, and, curiously enough, the line, even in interpretation of light and shade when skilfully handled, lends life, reality, transparency, luminosity, and breadth; and in etching and pen-drawing, which is the extreme of a conventional medium, we

have the greatest triumph of interpretation possible to art, the means and the end being considered together.

Color, let it be remembered, is not an attribute of form, but an accident: its apprehension and use employ separate qualities of the mind. The relations of color are much more subtle and evanescent than those of form, and their perception in individuals much less strongly developed. Notwithstanding this, the use of color for technical purposes, and aside from considerations of beauty and harmony of combination, can be very well taught by an analysis of the changes of hue and tone which it undergoes under varying conditions of illumination and reflection. An isolated body, whose values of light and dark have been rendered in a neutral gray, can in water color be treated to a wash of local color with a very fair approximation to truth; and, if in addition the shadows be treated with warming hues which take their character from neighboring reflections, the result will be still more just.

Color does not properly come under the head of my discussion, and I therefore dismiss it with a word. It is the sensuous element in art—it is also the vitalizing power. At its entry into the composition everything is transformed, but it is a transformation that admits of no bungling. If its subtle laws are violated, the change is always for the worse. It expresses no essential fact of form, but it communicates the glow of life,—hence its charm. In its theoretical study there is much to be learned, but not all are competent to teach; and the present position of scientific investigation is by no means necessarily the final one. It is very difficult to dogmatize about a question so subjective and evanescent, and the subtleties which the artist weaves into an exquisite color poem are ever beyond the reach of exact science. Even the old controversy about the primaries has a subjective and an objective side, both of which should be considered.

But I would gladly dwell more upon the potentialities of the Line, the infinite symbol within whose compass lies the microcosm. In its varying convolutions man writes the epic of his existence and depicts the illimitable wonders of the visible world. At his will a few movements become deeply significant, and by its symbolism the laws that bind the starry worlds may be held within the palm of the hand. The language of form is written in the Line traced by the divining-rod of man's intelligence; and the line must ever be the primary medium of formal interpretation, because it is the symbol of limit, of the finite, of the concrete. He who is master of the Line speaks the universal language and is master of the world's constructive intelligence.

In closing, I must ask your indulgence for a very unworthy presentation of a very worthy subject. I must close what has already gone, I fear, beyond the limits of discretion, by a single exhortation, which is *System*, logical System. From beginning to end the subject of Form and its language is a coherent development, an exact science, based upon law and extended to practice and observation. Train your teachers thoroughly, not as sciolists and smatterers, but as bachelors and doctors of Art, and educate your students rationally, not by the hap-hazard methods which I fear are too common. There is no reason why every one should not write the Language of Form.

intelligibly, the majority with fluency, and very many with skill and beauty. Surely there is no nobler, diviner language spoken upon earth. As I have said before, I say again,—it is the only universal language ; it is the only perfect language ; it is the only unchanging language ; it is the only language in which a vast number of the most important facts of knowledge can be expressed at all ; it is the language in which are expressed many of the grandest and most beautiful works of human achievement ; it is the language in whose imagery are embodied the highest and most mysterious truths of the Divine Law,—it is the Language of Light.

Adjourned.

Fifth Session.

Friday Afternoon, April 10.

The Conference was called to order at 3 P.M. by President Walker. The following addresses were made : —

ADDRESS OF MR. H. H. BELFIELD, OF CHICAGO.

I am told that the meeting this afternoon is to be an "experience meeting," from which all metaphysics, poetry, and rhetoric are to be excluded. I am warned by the list of names that succeed my own that I must be brief.

I am asked to answer the question, What educational want has the Chicago Manual Training School supplied? In order that what I say may be more intelligible, permit me to say a few words concerning the school. It is not, as many suppose and as its name seems to imply, a part of the public school system of the city, but an independent school, owned, controlled, and supported by a body of sixty gentlemen known as the Commercial Club of Chicago. The members of this club, feeling that there was an educational want which the public schools did not supply, organized the school, and have contributed about one hundred thousand dollars to its foundation, equipment, and support. An average fee of one hundred dollars a year is charged to those able to pay it: others, if properly qualified, are admitted free. While hundreds of boys have been refused admission for want of room and other causes, no boy has been denied admittance for lack of means.

I. Has the school supplied a want? II. Is this want an educational want?

I. That the school has, to the extent of its curriculum and capacity, supplied a want is evident from the following facts : —

The city of Chicago is well supplied with excellent public high schools, eleven in all, in which no charge is made for tuition. But the great majority of the pupils of the Chicago Manual Training School are graduates of the city grammar schools, and have been admitted to the city high schools. Rather than attend a city high school within a few minutes' walk or ride of their homes, our boys travel miles to reach the manual training school, many of them coming long distances. Some of those who depend on railway transportation are compelled to rise early and return home late. Some, especially those living outside of the city limits, in the suburban villages, where there are good schools, travel from ten to thirty miles daily. Two of our graduates of last year made a daily journey by rail of eighty miles,—forty miles each way,—for three years, not-

withstanding the existence of an excellent high school in their own city, Aurora. Certainly, the nine hundred boys who have attended the school during the seven years of its existence have felt the need of something more than could be obtained in the public high schools. Else, why have they been willing to rise early, stay late, and travel many miles in all kinds of weather?

These boys do not come against their will. The school refuses to receive a boy who does not desire to attend it. It is not a reform school. They do not come to escape work, since the school exacts of every one of its pupils, in addition to the regular high-school work, one hour every day in the drawing-room and two hours daily in the shop, making a school day of six and a half hours, and rendering necessary the preparation of most of the lessons at home or on the train. Neither do they come for the purpose of learning a trade, since the greatest care is taken to impress on the minds of both parents and pupils that no trade is taught.

II. Is this want an educational want?

It is difficult to draw the line between an educational want and an industrial want. The professional schools, such as the schools of law, of medicine, of engineering, of pedagogy, even of theology, offer an education which enables a young man or woman to earn an honest living. Such an education may without offence be called an industrial education, when it has for its object the support of one's self and family. In like manner, the colleges fit men for the professional schools, and the high schools fit for the colleges, with the ultimate object of educating for self-support. I have no doubt that many boys are attracted to the manual training school because it enables them to gain a livelihood immediately on graduation. Others come because the curriculum of the training school is a better preparation for a technological course, while at the same time it affords a regular high-school course of three years. If the manual training school were to offer only shop-work and drawing, without academic, or book, work, I believe it would be deserted by every boy now in it.

There are many boys in the manual training schools who are preparing for the college classical course, expecting to take their fitting in Greek or Latin, or both, after leaving the training schools. Several of the private schools in Chicago that make a specialty of fitting for college advertise manual training as a part of their course, in order to retain boys who are destined for Yale and Harvard.

Some light may be thrown on this subject by examining into the present occupations of the graduates of the Chicago school, whose first class graduated in 1886. They may be roughly divided into three nearly equal classes. About one-third of them are in higher institutions of learning, in schools of technology, law, medicine, or the classics, principally the first named. About one-third are employed in manufacturing establishments as draughtsmen, designers, foremen, etc. The other third are in actual business life, in engineering, in merchandising, in clerical work, etc. One of our first class is a lecturer in the Massachusetts School of Technology.

Since the manual training school does not teach a trade, but fits for higher schools, and for many occupations in which technical skill of hand is not required, I do not see why the want which it supplies is not an educational want.

What is it that a school does for a boy that leads him to enjoy himself and recommend it to others? For it may be said, in parenthesis, that the most enthusiastic advocates of manual training are the pupils and graduates of a manual training school, and that the younger brothers usually follow the older ones to the training school. As has been said, he must *work*. His three daily recitations from books demand an average of three hours' study at home, in addition to the hour or more which he can give to them in school. He enjoys his shop-work, and generally has a small shop at home. It gives him something to do at home. It keeps him off the street. As an aid to discipline in school, the shop-work is worth all it costs. Discipline, as the word is frequently understood, is unknown in a manual training school. The school improves the health of its pupils. This is the testimony of the parents of the pupils. An amateur astronomer, who will be known to fame, lately applied for the admission of a younger brother, in order to improve his health, as his own had been greatly benefited by his work in the manual training school. In fact, I am compelled to be on my guard against an influx of sickly boys whose parents regard the school as a sanatorium. For several years I feared that we might overwork our pupils; but this fear has disappeared. Boys are sometimes withdrawn from school on account of sickness, but never for illness produced by school work.

The school brings the boy into an experimental knowledge of the material forces of modern civilization. It supplements the more theoretical work of the regular school. It develops the judgment and will power. It teaches him that the object of life is not only the acquisition of knowledge, but the power to use that knowledge. The school work instils a respect for manual labor. The son of the millionaire, the boy who has never before learned that his hands were made for work, toils at the forge with the same energy that is shown by the boy who has always known work, and with probably greater pleasure. To some boys such work has the charm of novelty. As the shop-work continues, with increasing strength and skill comes the consciousness of power which develops a manly self-reliance, evident to all who come into contact with our upper classes.

The school assists the boy in determining for what he is fitted. It frequently prevents him from undertaking that for which he is not fitted.

It should be the province of every school to foster and develop a taste for reading. Our school does this to a marked degree, chiefly, but not wholly, in the line of science.

I am often asked whether the manual training school can do anything for the "dunces," for those who dislike school and fail to succeed in it. There are two kinds of dunces,—those who lack interest in books, but possess ability, and those whose earnest efforts to comprehend the printed page are lamentable failures. The former are generally active, energetic boys, who enjoy sport rather than study. We often succeed in getting their interest in shop-work and drawing aroused, and then easily transfer it to their books. Such boys frequently become our best scholars, astonishing their friends by the ease with which they master their lessons, and the enjoyment derived from them. To the other class of boys the text-book has

always been drudgery. They have never known the pleasure of learning a lesson well. Their books have contained words only, not ideas. Such boys are often difficult to arouse, and they sometimes leave us mutually discouraged. But not always. It often happens that such boys can understand what they can see and handle, that they obtain clear ideas and correct habits of reasoning in the shop and drawing-room, and that this improvement in their mental processes is, by some means which the psychologists may explain, soon discovered in every part of their school work. Such boys often fail miserably in the first half of their first year, and make excellent progress thereafter. That manual training creates brains no one claims: that a judicious and skilful employment of a boy's brains in training his hands has thrown light on many a path that has been darkened by failure and discouragement admits no denial.

ADDRESS OF PROFESSOR W. S. CHAPLIN, OF HARVARD
UNIVERSITY.

The Manual Training School of Cambridge has not been in operation long enough to graduate any students, and we cannot say that it has produced any results that can be clearly stated here. It was founded through the generosity of Mr. Rindge. Mr. Rindge is a man who not only has money, but who has a purpose in spending that money. He wishes to see it produce results. He believes that the solution of the social question depends on Christianity and manual training; that in manual training or something like that is to be found the means of bridging social distances and avoiding social troubles. When this school was started, that was one of the motives.

The teachers in the other branches of the school are under the direction of and are provided by the city of Cambridge. That is the only part that the city has in maintaining the school. The school is therefore partly under the school committee and partly under a managing committee appointed by Mr. Rindge. I have been asked how this works. Is this double government satisfactory? Is this connection with the high school satisfactory? I may say that in this case there has been no trouble because of the good nature of the masters of the two schools; but I think that in nearly all cases it would be better to have a school which gives manual training entirely distinct from the school which does not give it.

The school in Cambridge started under certain disadvantages. It did not get a fair sample of the students of the high school. Of course it got some good, and some not so good; but it seems to me that the class of students who entered at first were not, on the whole, as good as have entered since. The fact was, the people did not understand what the manual training school was. They had an idea that it was to be a trade-school, and I am not sure but some of the managing committee thought it was, too. But the school has passed out of that condition; and it is a manual training school, not aiming to make tradesmen, but to educate through manual training.

The school has not only regular scholars and classes from the high school, but from a private preparatory school, and a class also

from Harvard University. The pupils do about two-thirds as much studying from books every day as do the pupils of the English High School. They spend three years in this Manual Training School. Hence they get half as much book-learning as they would get in the English High; and, besides this, they have an hour a day of mechanical drawing, and two hours a day of shop-work.

It is altogether too early to speak of results, as no class has been graduated since the foundation of the school. But you cannot pass through it without seeing certain tendencies which we may consider results. First, the pupils seem to progress rapidly in the use of their hands and their eyes. You will notice in the lowest class a certain timidity about using a tool: they have not learned to trust their own judgment. You will observe in the highest class that the boys use their hands and eyes with entire confidence. That is something that they cannot gain out of books. They have learned to measure their own strength. You can see a difference in the pupils in the matter of manliness. It was necessary to have some system of government among the scholars. As the military system could not be introduced, a fire drill has been introduced in its place. They have their foreman and officials, and the boys behave in a manner which seems to me entirely satisfactory. There has been a distinct growth in manliness. There has been no need of any disciplinary measures in the manual training part of our school. Every boy feels a responsibility for the work given, and does it like a man, and is anxious to do more than is required. I think they take, what we all like to see in mechanics, a pride in doing a good job.

The boys learn how to use tools and how to take care of them. While they are taught entirely for education, not at all for trade, while it is not the purpose to turn out skilled workmen, yet these boys do about the same quality of work as would be done by a journeyman. As to quantity, a graduate of the school, a boy in the highest class, probably could not do as much as a man. He is not as old, as strong, as tough, and would not restrain his impatience as well. But it is established that a boy who has been through the school will do the same kind of work taught in the school as well as the mechanic, and that he could do about two-thirds as much.

They always work from drawings, never from anything else. They learn to make these drawings themselves, and they have this advantage over the average workman. They understand, they interpret, and are able to put a drawing into three dimensions. The picture is flat, but they see it as length, breadth, and thickness.

I believe we shall attain the results we expect. The idea sometimes seems to be that, if we can start a new method of education, we can make a new kind of man. That I somewhat doubt. After we have tried all these methods of education, we shall find that we have about the same kind of man as before. They may know more, but they will be about the same kind of human beings. The great advantage of this method is that it gives another method of expression. We have always judged unjustly those persons who had not a chance to express themselves in this way. Some men cannot express themselves in any other way. Ericsson was an example. He had to have pencil and paper, and whatever he did he worked it out with minute-

ness. If he had been limited to language, I doubt if we should ever have seen a Monitor. You have heard of Dr. Nott. You would not be long in New York without hearing of him. He was a great light in education. He led Union College up to a very high point. He conceived the idea of a base-burning stove. He had the idea fully worked out in his head ; but he could not understand drawings, neither could he make them. The only thing he could understand was the object itself. Limited in this way, he went to work to make a base-burning stove. There is not a boy in the highest class at the Cambridge Manual Training School who, if he had the idea of that base-burning stove, could not give an intelligent description of that idea by drawings, so that a mechanic would be able to take his rough drawings and put them into shape. It cost Dr. Nott \$200,000 to get up his stove successfully. It would have cost him almost nothing in comparison if he had been trained to express himself through drawings. Manual training schools give the pupils this power of expression.

MEANS AND METHODS OF MANUAL TRAINING.

BY C. R. RICHARDS,

DIRECTOR MECHANIC ART DEPARTMENT, PRATT INSTITUTE, BROOKLYN.

Twelve years have elapsed since manual training exercises were first added to the curriculum of an American high school for the educational purpose that we recognize to-day.

In the time since then many active minds have been at work upon the practical details of the problem, and many data have been gained from actual experience, and many principles definitely formulated; but much still remains to be done.

This departure is of too radical a nature to be adjusted in a day or a year, and it will only be when the perspective of time allows of nicer comparisons that final judgment will be possible upon the quantities involved.

The first essential in approaching the problem of a manual training course is an entire appreciation of its purpose. Little can be done in applying means before a thorough grasp of principles is obtained : and, unless educational motives have inspired the design, we can expect but meagre educational value in the results. It must be realized that mental discipline, and not physical cleverness, is what is desired,—not trade expertness, but a strengthening of the executive powers.

It so happens that certain operations of certain familiar trades happily serve our ends; but this in itself is the more reason that we must keep our true aim steadily in view, and not allow the practices and prejudices of these trades to turn us aside from right educational principles. Because there may be a best way to train a carpenter, it does not follow that the same method is of equal value in the offices of a manual training school.

Unfortunately, trade methods and trade traditions have influenced the character of manual work in the schools altogether too much.

Even where exercises in wood-working have been introduced into grammar-school grades, enfranchisement has not been secured, and large saws and planes have been put in the hands of boys entirely unfit to handle them. Reply is made to criticism of such methods, "Oh, we cannot do anything without the planes and saws: they are the carpenter's first tools." Carrying out this principle consistently might bring us to the use of the axe. But we are working here for abstract ends, and dealing with the subtle problem of intellectual development; and the whole difference between success and failure may be entirely a question of methods. There are two vital principles which should dominate every attempt to plan a course in manual training: first, the means employed must be distinctly fitted to the capacities of the pupil, and the greatest care must be observed in grading the successive stages of the work, so that each exercise fits easily on to what has preceded, and the course progresses smoothly along the line of natural development; second, the fitness of every exercise must be judged by the degree in which it advances disciplinary or intellectual ends, and by no other standard.

Each exercise should be such that the pupil may entirely appreciate its meaning, and with reasonable application be able to accomplish neatly and accurately. Anything beyond his powers, which can only be executed in a poor and bungling manner, will contribute none of the healthy influences of manual training, but will rather defeat them and tend to set a lower standard for all performance.

Another point which needs particular care is the relation of the shop-work to the other studies of the school. We must not think that the *spirit* of manual training is realized when so many exercises in joinery and blacksmithing are added to the regular work of a school, without any regard to their mutual influences. If we are aiming at harmonious development, we must use harmonious means. On the side of practical details the rooms used for the shop operations perhaps come first. These must be lighted and aired with even more care than in the case of ordinary school-rooms. Where close observation plays such a critical part, the best of light is needed, and the increase in muscular activity demands thorough ventilation.

The shop-rooms should be structurally separate, if possible, from the portion of the building containing the class-rooms, so that the noise of work, and particularly the rattle of the machinery, shall not interfere with the operations of the other school work. On the other hand, the connection between the shop-rooms and the class-rooms should be made as convenient as possible by broad and direct hall-ways, so that the time and confusion of passing from one to the other may be reduced to a minimum. The plan which lends itself most entirely to these conditions would seem that of placing the shops in a one or two story structure, separated from the main building by a free space, and connected with it by a liberal passage-way.

Finally, and perhaps most important of all considerations, is the quality of the instructor. The individual nature of manual training methods or instruction renders it even more necessary than usual that the teacher be a man of considerable character. He must be able to clearly express himself; he must be conscientious and patient; and last, but not least, he must fully recognize the meaning of his work.

The pupil's time is far too precious to be intrusted to a rule of thumb mechanic, who has no conception of educational purpose, and whose influence would bear no harmony with the rest of the school work.

The shop-work curriculum of the manual training high school for boys, with which this paper is alone concerned, has, with a few notable exceptions, defined itself into a generally accepted system. In this scheme, the first year deals with operations in wood,—first the elements of joinery, then turning, and later pattern-making; in the second year, practice in moulding and forging, and sometimes tin-smithing; and, in the third year, both hand and machine work in metal.

The other plan carries on the instruction in wood-working and in metal-working together, in the belief that the change from one operation to the other affords an agreeable variety, and that the character of each has a beneficial reaction upon the other. The advocates of the more generally adopted plan hold that the order of progression from wood to hot iron and then to machine-work represents a natural sequence from the easy to the more difficult, and that the results in each line of work are stronger when the attention is concentrated upon one set of operations at a time.

In the course pursued at the Pratt Institute the first exercises give practice in the use of the principal wood-working tools,—the saws, plane, and chisel. At the same time the use of the laying-out tools—the rule, try-square, scratch gauge, and dividers—is brought in, and the pupil led to see that, in order to *come out* right, it is necessary to *start* right, and that his foundations must be laid with the greatest care. After these, practice in joinery is taken up, at first with simple forms, and then, as the pupil becomes more skilful, leading on to more complicated relations of parts and more difficult constructions. This work in joinery is undoubtedly a great stimulant toward care and accuracy of performance. Every hasty or careless stroke is rewarded with an obvious *defect*, which the eye traces back to its *source*, and so makes of each exercise a continued illustration of the law of cause and effect. The work in joinery should not attempt to go far beyond the construction of single joints, but may well show their applications in a few typical forms, such as a door and window sash, and perhaps with the project of a finished box.

In all this work of instruction in the shops, class methods are steadfastly adhered to. The instructor carefully executes each new lesson before the whole class, at the same time explaining the proper method and the principles involved. Each pupil then takes up the work, and the instructor gives individually what further advice or correction is necessary. By this means, and by this means alone, can a class be kept together, the instructor's strength economized, and the most efficient results secured. Unless this method is followed, the pupils soon become scattered, each is working upon a different operation, and the instructor goes from one to another, giving one kind of advice here and another there, until his nervous strength is completely exhausted and his class demoralized.

Through this, and indeed all of the shop-work, the pupil is guided by reference to an accurately made drawing of each piece. In all making, the worker must form a mental concept of the thing to be

done; and nothing so much strengthens the power of forming that image with clearness and precision as practice in working from a drawing. Here the facts are given in a certain order, and intelligent study translates them into a complete and definite conception of the desired result. In certain schools it is the practice to have the pupils make these drawings themselves during the shop-work period; but it is believed that the use of a carefully prepared standard set of working drawings both saves considerable time and by placing before the pupil a neat and accurate image of the thing to be made does much to raise the ideal of performance.

For the work outlined above, strong simple benches with vise, and some provision for holding the tools, are needed. The arrangement for the tools should keep them secure from dust and injury, but should present them immediately available for use when needed. A drawer is quite inadequate for the purpose, as the tools shift in hopeless confusion, and are liable to injury. A shallow, upright cabinet on the top of the bench answers the purpose admirably. Some provision must also be made for storing the work of several divisions of pupils without confusion. One convenient method is to place a series of small drawers, or cupboards, in the bench. One of these is assigned to each pupil using the bench; and in this he keeps the work that he is immediately engaged upon, the finished pieces being removed at short intervals and marked. This allows the compartments to be made quite small and to be kept neatly. In this as in all other lines of manual training work, few but good tools are required. It is not the number, but the character of the operations, that is important; and the tools used must be considered, not so much in the order of their importance to the carpenter, but in the order of their value as *hand* and *eye* trainers. The danger is in trying to do too much. There are scores of operations which would consume much time without materially serving the ends desired. The question is not what we might do, but what best contributes to the steady development of the pupil. After this work at the bench the operations of wood-turning are pursued. This practice adds an extremely valuable element to the course. Here muscular effort is replaced by the most delicate touch. The hand no longer supplies power for the tool, but simply guides it; and this guidance requires the greatest watchfulness and nicety of movement. No line of shop-work affords such an opportunity to develop the appreciation of form in design as the wood-turning. The free outlines of its projects offer constant illustrations of the subtle qualities of curve, and every exercise should present a model of good proportion and grace of form. In fact, the practice is an unequalled training in form-perception, and can, with the greatest benefit, be directly connected with instruction in the elementary principles of design. The operations of metal-spinning give a further opportunity of advancing this training, and with the addition of a few very simple tools, simple and graceful forms of cups, boxes, trays, and knobs, may be worked out in thin sheet metal. For this work in turning, light but well-made speed-lathes, operated by power, are required. Foot-lathes are inadequate for the purpose. For operations of such delicacy the unskilled pupil must concentrate his whole attention upon his work, and the effort necessary for driving by foot distracts

his thought and impairs the efficiency of his results. Cupboards to hold the work immediately engaged upon are necessary, as before; and it is even more essential than before to have the tools placed immediately available to the hand. After this practice in turning, the work in pattern-making follows. The making of patterns involves operations both with the bench tools and in turning, and also brings in very exacting requirements in regard to care and forethought. It is of prime importance that the pupil should thoroughly comprehend the meaning of every operation that he undertakes, and should make no step before he understands its purpose; and, in order that this appreciation may be secured of the ways and methods of pattern-making, it is essential that the operation of moulding should be illustrated at this stage, and its leading principles carefully explained. With the comprehension thus gained, the pupil can go forward intelligently upon his work of shaping means to an end. This completes the shop-work proper of the first high-school year. Accompanying the instruction and interspersed throughout the year are given frequent talks upon the principles involved in the work, and upon the properties and natural history of wood. These talks include "The Action of Cutting Tools," "The Growth of Trees," "Distribution of Lumber Forests in the United States," "Processes of Lumbering," "Physical Properties of Wood," "Principles governing its Disposition in Construction," and "Specific Properties and Values of Different Woods." These talks are given about once in two weeks, and are illustrated wherever possible by charts, maps, and specimens. This analytical and explanatory matter is believed to be an essential part of any manual training course; for, the more thorough is the pupil's knowledge of materials and processes, the greater will be his command over them, and the greater will be the benefit that he derives from his work.

In the beginning of the second year, with the patterns already prepared, the pupil is introduced into the foundry, and there practises the operations of moulding in sand. The nature of this work is essentially different from anything that has preceded. Here the results are a large part of the time hidden from sight, and the project can only be carried through to success by keeping each step clearly in mind and carefully forecasting the effect of each new move. This discipline of the imagination gives to the practice in moulding no mean educational value. At this same time the methods and applications of plaster-casting in the arts are explained and duplicates of clay and other originals obtained. This latter work is prosecuted in direct connection with the clay modelling which is going on at this time. During the course explanation is given of the construction and operations of the cupola and of the physical properties of cast iron and the other materials dealt with. The processes of casting on a large scale, and the modern and ancient methods of statue-casting, are also described and illustrated by charts and models. The equipment required for this work is of a very simple character. A trough bench to hold the moulding sand, a wooden flask, and a few of the moulder's simple tools constitute the essentials. In large schools, where considerable quantities of castings are consumed in the machine shop, it is a great convenience, and gives an added value to

the instruction, to include an iron-melting cupola in the equipment, and to make the needed castings in the school; but this is by no means essential. From this shop the pupils go to the tinsmithing benches, where, after soldering various forms of simple joints, they apply the principles of surface development, previously learned in the drawing-room, in making various forms of pans, bowls, cups, pipe joints, etc., in sheet tin. The operations of this work may be conducted on long, continuous benches, with gas connections at intervals for the heating furnaces, and a small drawer for the pupil, to hold the few tools needed. Besides these, a larger bench for laying out the work, and cupboards to store material, complete the outfit. At the end of this work a course in forging is entered upon. Of all the shop-work in the manual training school, none is more beneficial in its effect upon the character of the pupil than the practice at the forge.

In other kinds of work there is time for deliberation, time to determine just what to do; but here he must strike while the iron is hot, must think quickly and act quickly. In this branch, more than any other, perhaps, the results depend very largely upon the manner in which the course is planned. As Emerson says, "Tis as easy to twist iron anchors and braid cannons as to braid straw, to boil granite as to boil water, if you take all the *steps in order*." And this principle must be most carefully observed. The pupil must be introduced to the new work by the simplest exercises, and progress at first be gained by very easy stages. Gradually, the more difficult operations may be reached; but great care should be taken to relate each exercise to what has preceded it and to what is to follow. In order to still more assist the pupil in approaching the subject, many of the exercises are first worked out in lead. This gives the pupil time for deliberation and thought; and a knowledge of the correct treatment is acquired, which gives him a great advantage in dealing with the hot iron. It is surprising what difficult pieces and what nicety of execution may be reached when these points are observed. Quite a comprehensive course in drawing, bending, and welding different forms in irons is pursued at the institute, ending with the forging and tempering of a set of steel chisels and lathe tools to be used in the shop-work of the next year. The work is generally finished by some simple ornamental piece, which serves to show the possibilities of wrought iron in this direction and to emphasize right principles of design. Particular care is taken in planning these projects to consider the nature of the iron and to produce objects possessing a definite value, and not merely fanciful in their character.

The arrangement of the tools and fixtures of the forge-shop is a matter of considerable importance, inasmuch as it is essential that the greatest possible facility of operations be secured. The forges should be simple in construction and convenient of control, with a small fire-bed and open hearth, that the pupil may see clearly the condition of his piece while heating. The coal and water troughs should be placed conveniently at hand, and the anvil carefully located in its proper position relative to the forge, on strong wooden posts sunk in the floor. It is well to have the anvils placed at varying heights, in order to accommodate different-sized boys. A small

stand to hold the tools is also needed. To supply the blast for the forges, fans driven by power, though not absolutely essential, are very desirable. The labor of working a hand forge, though only required during the heating, prevents entire attention being given to the condition of the iron and to trimming the fire, and interferes with quick handling of the piece for the operation of welding. The only objection to the use of power blasts is the cost of fans and piping, which, in the case of large shops, is somewhat considerable. The unsightliness of a mass of piping carried through the air may be much relieved and a gain effected in the efficiency of the system if the blast piping can be placed beneath the floor. The shop-work of the third year deals with the operations of the machinist, at first with the hand tools, the files, and chipping chisel, and later with the power tools, the engine lathe, planer, drill, etc. Practice in these most exacting of all mechanical processes enforces methods of patient accuracy, and does much to promote habits of care and persistence. The operations with the power tools give an insight into the principles governing the action of machines, and acquaintance with the possibilities of mechanical device in accomplishing varied ends. It is a mistake to think that because these machines are to a certain extent automatic their use is devoid of disciplinary value. On the contrary, they contribute elements of distinct and unique benefit to the school work. In work with the hand tools it is only necessary to keep the attention upon a single operation; but in the use of machines the pupil must keep in mind many different functions, and work toward his end by intelligent combination of various elements. This certainly represents a training of the executive powers.

Another point to be noted is the fact that, whenever muscular power is eliminated from tool-work, and the entire energy devoted to guiding the course of the operation, much smaller quantities can be dealt with and a far greater degree of accuracy realized; and this means closer observation and increased care. The equipment of this shop is necessarily the most expensive of all, and every care should be taken to reduce the outfit to its simplest possible form. For the chipping and filing, strongly constructed benches, carrying vises and containing drawers for the tools and files, are needed. The engine lathes provided can be quite small, but well made, and cupboards for tools and fixtures should be placed under each. A few speed-lathes for centring and hand-turning, a planer and drill, constitute the remaining essentials. Other tools can be added with benefit according to the resources of the particular school.

This comprises the shop-work proper of the manual training high school. Each branch has its particular purpose and value, and all together form a system which coincides with the natural development of the pupil's capacity; but the principle of manual training is superior to any special means. If conditions should render one or even all of these processes impracticable, others could be found to take their place, though not, perhaps, with equal efficiency.

In order to convey a more thorough comprehension of each thing dealt with, instruction is given during the last year in the study of the elements of mechanism, with especial bearing upon the details of the

shop tools. The theory of the steam engine is also analyzed, and the strength of materials studied, both of the latter being accompanied by laboratory practice. The second study is taken up in the belief that instruction in the fundamental principles involved in the action of this great agent of modern civilization should be an integral part of any scheme of general education, and the third in order to give an idea of the elementary principle governing the distribution of material in all construction. The various processes of making iron and steel are also explained during this year, and visits paid to adjacent steel and rolling mills.

The course in drawing bears such intimate relations to the work of the shops that I venture to add a brief outline of the course pursued at the Pratt Institute.

At the beginning of the first year free-hand working drawings of simple geometric solids and wood joints are made. This practice gives the pupil an understanding of the principles of a working drawing and an ability to read them, which is directly helpful in the shops. After this the use of instruments is taken up, and the practice in working drawings is continued.

The second term commences with outline drawing from casts and simple effects of light and shade, followed by free-hand perspective. Later the elements of design, as related to common objects, are studied. This instruction is brought in at the same time that the class is engaged upon wood-turning, and does much to assist the appreciation of form-value in the different exercises. Several pieces, such as tool-handles, rosettes, and napkin rings, are designed in the drawing-room, to be afterward executed in the shops.

In the third term geometric problems, surface development, and intersections of solids are taught. These directly prepare the pupil for the operations of tinsmithing, which come in the next term.

In the first term of the second year the elements of design as related to decoration are studied, and instruction is given in clay modelling. This practice in clay modelling is obtained at the same time that the moulding is being carried on, and the casting in plaster is brought into immediate connection with the clay-work.

The second term introduces the elements of architectural drawing and study of the historic styles, while the third term is occupied in drawing of the machinery details.

In the drawing of the third year the endeavor is made to represent something more than the elaboration of the principles already gained, and to make the drawing serve its legitimate function as an expression of thought. For this purpose the subject-matter of the course is gained from the studies of the year that have been previously mentioned. The study of the elements of mechanism contributes the data for laying out cams and gear teeth, and the study of the steam-engine makes the pupil acquainted with various details and the principles of valve-action. These serve for the work of the second term.

Lastly, the study of the strength of materials gives opportunity for many problems in construction which are worked out in drawings during the last term.

The close relation between these two lines of work that have just been described should represent the union of manual training with all

the other lines of school work, in spirit, if not in actual forms. Once the principle of manual training is assimilated, its presence makes poor methods in class-room work impossible, its thought pervades instruction in the other studies, and the methods of the whole school must advance. This is true to such an extent that we can no longer translate the term "manual training" by its literal meaning, but rather by what it has come to stand for,—an endeavor to reach the ideal in educational methods.

ADDRESS OF GEORGE B. KILBON,

DIRECTOR OF MANUAL TRAINING, SPRINGFIELD.

The first work done in Springfield in this direction was in 1878, when Mr. Milton Bradley arranged to open his shop for the purpose of teaching such boys as wished, out of school hours, manual work. The price was to be one hundred dollars a year. The offer met with no response, and the boys had to wait five years longer. In 1883 a company of seventeen citizens, in response to a call through the daily papers, met and discussed this question, and decided that it was wise to establish a school of art and industry. A subscription paper was passed, but not enough was obtained; and again the boys had to wait. It was then left to a bright, active woman to do what the men had failed to do. In January, 1885, a mother who was interested in having her boy taught, asked of J. R. Smith, superintendent of the Springfield Iron Works, where he could learn the use of tools. She was told that, if she would bring nine boys, a room and teacher would be furnished. Inside of a week that was done and arrangements made by Mr. Smith to start a school. We were to start with nine boys. In the mean time the newspapers got hold of it, and instead of nine there were forty boys! Twelve lessons were given for seventy-five cents a lesson; and five dollars' worth of tools was provided for each boy, which he paid for. This was so satisfactory that the boys wanted more; but it was almost summer, and we could not give twelve more lessons at the time, so waited for fall. When the fall came, growth had been such that the enterprise demanded enlargement. Therefore, we waited till further arrangements could be made. The school committee took hold of it, and asked the city for a thousand dollars for the experiment. The city granted a hearing, and gave the thousand dollars in April, 1886. One-half of this sum was spent in equipment, and the other half in paying for tuition. Twelve benches and twelve sets of tools were bought, and the school commenced. So satisfactory was the experiment that the next two years the city gave three thousand dollars a year, then four thousand for two years successively, and this year voted forty-five hundred. So one may see the interest has been growing from the outset. The school is on a substantial foundation, because it has been accepted by the school committee and is under the regular school *régime*. We have now eighteen joinery benches, eight wood-turning lathes, a moulding equipment of twelve, a carving equipment of eighteen, and a partial equipment for iron-work, consisting of one forge, one planer,

one engine lathe, one drill-press, four vises, and four sets of bench tools. A Shipman engine of six-horse power drives the machinery.

The Springfield Manual Training School has two departments, high school and grammar school. Its high-school department consists of a three years' course of daily work in scientific study, drawing, and manual work, providing for joinery, wood turning and carving during the first year, forging, pattern-making, and moulding during the second year, and iron chipping, filing, and finishing during the third year. The grammar-school department consists of a one year's course of weekly lessons for the senior grade. In both departments the manual lessons are of one and one-half hours' duration, the drawing lessons in the high school being three-quarters of an hour.

A third department of the manual school is projected. We have some wide-awake lady teachers among us who wanted something of the kind; and, when an opportunity was offered them to learn the use of tools, thirty-seven improved it. They were organized in three classes, and went on with the work, happy as could be, happy as any set of boys, and did as good work. I thoroughly believe in women's rights, and girls' rights, too, and know of no good reason why girls should not handle tools as well as boys, if they wish it. Why should they be refused the same development? The use of the fingers is necessary to them as well as to boys; and I have little sympathy with objections to this, but a great deal of sympathy with any woman who wants to know how to use tools.

After some months of work, another question arose. A few of these teachers asked the privilege of giving manual lessons to boys under their charge, in grades fifth to seventh, which was granted; and ten dollars was expended for tools for an experimental class of twenty-four fifth-grade pupils. We arranged a course of lessons, in which the pocket-knife was the only cutting tool used. For laying out problems, five additional tools were used,—try-square, gauge, rule, dividers, and pencil. The work was done in the ordinary school-room, the desks being protected from injury by movable covers. The success of this led to the arrangement of a four years' course in knife-work. These years precede the senior grammar work. Our boys in the fifth grade are nine years old and upward. In this course we have first surface forms cut from thin wood, then some knife-carving, then geometric forms cut from thicker wood, then cubes, prisms, cylinders, and cones are cut, then a few joints are made. The fourth year mechanical and natural forms are cut, all done with the knife.

Our school at first met with some opposition, though I hear of none to-day. We have been able to take only one class of girls, though more want it. But we cannot do everything with the money the city gives us. This one class has done excellent work.

We thoroughly believe in drawing, and have an efficient drawing teacher. In regard to the interest of the boys, they are hungry for the work. I had one eighth-grade class in knife-work that came out of school hours, and twenty-one attended from half-past four till six every Friday. This shows their interest in the work. In the ninth grade, though drawing is taught in a systematic way, pupils do not draw the things made. We have prepared pieces of wood, and they

learn to use the gauge, the try-square, the dividers, the chisel, and the plane, closing the year with some project. In the high-school department each pupil draws every problem before making it. Much of the furniture of the schools has been made by pupils.

In regard to the discipline, we had at first some occasion to correct certain boys who were inclined to be troublesome, and denied them the privilege of coming to the school for a few weeks. When convinced through the co-operation of parents that good behavior was necessary to continued attendance, they came, acknowledged themselves wrong, and have since been the best boys in the school. One of these boys has become our best helper, assisting to keep the rooms tidy, taking care of the engine, and teaching a class of younger boys because he wants to. Such cases are very cheering to a teacher.

There are four fundamental rules in mechanics which all manual teachers and pupils need to understand and observe. In the first place, you must measure accurately. If you want a board a foot long, it will not do to make it one foot and the sixteenth of an inch. Second, you must make a perfect line. Third, you must cut roughly near to the line. And, fourth, you must finish exactly to line. These four rules must be understood and observed, to make a successful mechanic. You may consolidate them into two, and say, First, lay out your work where it should be; second, work to your lines. These four fundamental rules of mechanics are allied to the four fundamental rules of arithmetic.

Our knife-work in the lower grades is an excellent preparation for the general tool-work in the higher grades. Accuracy in measurement and skill in cutting to lines are both acquired. The Milton Bradley Company have published the first year of knife-work, and have it for sale for fifty cents; and they are now preparing the next three years. The whole will be out in a few months. The exhibits in this building show what knife-work is capable of. Mr. F. A. Hinckley has introduced it into Florence, and Miss Palmer at Brookline has made use of it, both of whom have exhibits in the rooms below.

I have been asked what connection the Springfield knife-work has with sloyd work. We view the sloyd work from two standpoints. As a system of manual instruction, it antedates manual work in America. We frankly admit that it takes this precedence, and those who have done what they have in sloyd should be held in love for their work's sake. As a system of problems, however, we deem it faulty, because so much effort is made to have every problem an article of use. That conception seems to us erroneous. We do not conceive of other educational problems in that light. You would not go to a merchant and ask for his ledger, that you might bring it into school and add up the columns of figures in order to do some practical work. The merchant would laugh at your proposition. He would have to add the columns afterward to see that they were right. The effort to make every problem a useful article shuts out a great many problems which can be used to advantage educationally, and which are of value only as educational problems.

In regard to the pocket-knife, I believe that it can, and ought to be, redeemed from the obscurity to which it is relegated,—an obscu-

rity typified by the darkness of its receptacle. The pocket-knife is largely looked on as an instrument for whittling kindlings or carving names in inaccessible places, or as a toy with which a clever Yankee occupies his hands while he drives a sharp bargain with his brain. It is capable of doing clean, straight work, and ought to have a chance to be so educated; and our boys are the ones to give that education before their hands are strong enough to properly hold a chisel or drive a plane.

We have also in Springfield sewing, paper cutting and folding, and clay modelling. The outline in the mind of our educators is that the kindergarten should be followed by clay modelling, this to be succeeded by the knife-work, which in its turn should continue till pupils reach the age for a general tool course. That will give a consecutive course of manual training from the earliest years up through the years during which the public school has charge of the pupil. We do not claim to be omniscient; but we have done the best we knew how. We shall do to-morrow better than we have done to-day, because we shall know better then what we want to do. I thank you for your courtesy.

MANUAL EXERCISES AS AN AUXILIARY IN THE FORMATION OF INTELLECTUAL HABITS.

BY DANIEL W. JONES,

MASTER OF LOWELL SCHOOL, BOSTON.

From Comenius down teachers have acknowledged the need of something to awaken the intellectual faculties besides mere book studies; something to put the minds of children into a state of vigorous activity, and to incite in them a desire to learn.

Dr. Dickinson says, "If we desire to construct such a system of public instruction for the youth of the country as will best prepare them to discharge with efficiency and fidelity the duties of private and public life, let us make ample provisions for the complete training of the powers of observation, for an accurate knowledge of facts, of analysis and comparison." Horace Mann told the teachers of his time that, if they would give one-half of the school hours to creating a desire to learn, more would be accomplished than by giving all the time to book-work. There is now a general belief throughout the civilized world that the curricula of the schools need exercises which shall train eye and hand, and thus better cultivate the perceptive faculties. There have been many experiments to awaken the minds of children, with more or less success, and thereby prevent the lazy, listless habits that idly dream away time.

In a section of this city, for thirty-two years, I have been "teaching the young ideas how to shoot," but many of them never hit the mark: they would not even take aim.

Have not all of us felt that book-work alone comes short of realizing all that is desirable in developing the powers of observation, concentration, discrimination, exactness, and especially the will-power, that engine that propels all intellectual faculties? A few years ago we

thoroughly tried the Pestalozzian object teaching, by which a child is taught that a cow has four legs, that a cat will scratch, that ducks swim and hens do not, that chalk is white and charcoal black, and in other ways assisted children to find out what they already know, or will soon observe for themselves if let alone. For some reason this system did not prove to be very powerful in causing children to observe for themselves or in creating enthusiasm in teachers. The discipline we need to add to book-work is *exactness*. It is not seeing and handling only and applying adjectives, but we need exercises that require correct measurement and observation, and careful making, with a lively interest in the thing made,—exercises that demand attention, application, and *exactness*. The kindergarten, sewing, cooking, tool-work, and drawing for the purpose of making, under the name of manual training, prove, in my experience, more beneficial in these directions than any other exercises which have come under my observation.

We welcome this manual training just so far as it is an educational power, and no farther. Nothing is to be crowded out of the regular school work to give it a place. We want no more of it than will awaken the mind, and thereby *aid* in developing the intellectual powers. We want no gush,—nothing for mere show. Simple work *well done* is preferable to the complex twisting of paper and clay into a thousand meaningless forms. Manual training should inculcate accuracy and neatness every time. Accustom one to do accurate work in one direction, and it will permeate every act of his life, and that common habit of varying from the truth may become less easy. It is manual *dexterity* that gives *mental dexterity*.

From a careful observation of the effect of manual training in the schools under my charge, I feel confident that these exercises, wisely directed, have more power to energize dormant pupils and call forth the latent powers of children than book-work alone has. Drawing is an educational power, but its efficacy is doubled when used in making. When we observe fifty girls in a sewing class with their faces glowing with a desire to do correct and neat work for a purpose, we cannot question the appropriateness of sewing in the course of study. No person can spend an hour in the cooking school without being impressed by the high educational value of that exercise as an object lesson in chemistry; as a means of promoting care, patience, and forethought; as a study of cause and effect,—as good and as pure an educational training as the girls get in any school exercise.

It is necessary to keep ever in mind that the best results come when the work is done with great care, accuracy, and finish. The manual work may be as pernicious in developing slovenly habits, inaccuracy, and carelessness as the most vicious system of rote-learning. A general smashing into boards with saw, chisel, and hammer, making dovetailed boxes that won't hold peas, is no more an educational power than sawing and splitting kindling wood. Excellence must be the motto, as is so well illustrated in the exhibit below.

Bain tells us that the one circumstance that sums up all mental aids to plasticity is concentration. Manual training awakens the power of concentration in children in a greater degree than most other exercises do.

For a moment let us consider how it is possible for this manual training to awaken the minds of children in connection with book-work. In reading, the pupil thinks he does well if he pronounces most of the words correctly. In arithmetic, fifteen cents out of the way causes no uneasiness on the part of the pupil. The whole subject of language is largely taken, if taken at all, on faith. Drawing a square a quarter of an inch longer one way than the other gives entire satisfaction. A pupil may begin at both ends of a subject in history, and scatter the middle about like new-mown hay, and be as innocent of anything wrong as a babe. But long stitches will grin, and shame the girl in sewing. The heavy, flat loaf of bread forcibly reminds the girl in the cooking school that carelessness does not pay. In tool-work, hasty measurements and rude approximations will not answer the purpose. Ill-made joints bring on one the laugh of his fellows, and, what is of greater importance, his self-condemnation. Here exactness means something, and carelessness is emphasized. The boy puts together some limping English, and is not aware that anything is wanting; but, when he tries to smooth a board with a dull plane, he is forcibly reminded that the tool needs to be sharpened. A pupil's patience easily gives out when he tries over and over again a sum in arithmetic. In tool-work he is not so easily disheartened by repeated trials.

In much of our school work, children are required to learn things for which it is quite impossible for them to care. Mental food for which they have no appetite makes children dull and stupid, and their teachers complain of their inattention. Much study from books, and mere study, is a weariness to the flesh. But train the pupil's executive power by practical work, train his inventive and constructive faculties, develop the whole of him, and he will be more ready to do with all his might whatsoever his hands find to do. "Vitalize thought by applying the hands to work, and thought becomes no longer dormant."

The children exchange the lessons of the school-room for manual work with a large general increase of happiness. They go to work with a will. A dull pupil in book-work often wakes up and becomes interested when he takes hold of manual work; and the best of it is that this enlivening tends to have a reflex influence, so that at length book-work becomes no longer formidable.

This manual training is popular with the parents. For three years, only twenty boys were permitted to go from my class to the carpentry school in this building. The car-fares for each boy was \$3.50. Still there were many more applications than could be sent. We have this year fifty boys that attend the instruction of Mr. Leavitt in the Eliot Training School at Jamaica Plain. The boys rush home, get their dinners, walk a mile to the school, and are on hand at one o'clock, thus shortening their noon recess one hour. Sixty girls travel a mile and a half to attend the cooking school, all of which is done of their own free will and accord.

Go to any class of manual workers, and notice the application, the determination, depicted on every countenance, the concentration, the care, the energy, the accuracy, and the truthfulness of work there displayed, and is it possible for any one not to perceive a develop-

ment of intellectual power for which school work does comparatively little?

Two years ago the teachers of one of my primary schools, with eight teachers, introduced stick-laying, folding and cutting paper, drawing and making, modelling in clay, making in paper, color combinations, etc. These exercises have developed intellectual power which disciplines the school, gives zeal to the children and the teachers, and causes better work to be done in the regular school exercises than was done before this manual training was introduced. Besides, the children are happier. Consequently, they are more regular in attendance. This opinion is not enthusiasm. To be mistaken in what I have so plainly seen is an impossibility.

Two hours a week of manual training crowd out nothing, and give an intellectual discipline of a high order, something that gives pleasure and vigor to the mind. Besides, the dull routine of the old-fashioned school-room is broken, while the children learn that school work has some relation to real life.

Let us be grateful for the introduction of exercises into schools which will break up tiresome monotony, and teach children that

Life is real, life is earnest,
And the school recitation is not its goal.

President Walker invited Col. T. W. Higginson to speak.

Col. T. W. HIGGINSON.—I do not see how any one could have listened to the various papers this afternoon without drawing one or two general conclusions, which, it seems to me, may be very easily stated; and these two may then be followed by a third,—namely, the conclusion of my speech.

The first is simply this. You have been hearing from all parts of the country a variety of statements as to the details and methods of manual training as here exhibited. You have heard from the East and from the West, from the North and from part way to the South. You have heard, too, from those who looked at it more ideally to those who looked at it more practically. You have covered almost as great a range as in that conversation in Cambridge,—we always have fresh stories there, because there are always professors' children, and they are always saying queer things,—that conversation, I say, that took place between the little son of a professor of old classical learning and a small boy who had recently arrived in Cambridge from his native city of Chicago. Said the Cambridge professor's son, "I know what I am." "Well, what are you?" asked the new-comer. "I am a human being, that's what I am." "Well," said the other, "I don't know about that; but I am a Sucker, that I am." If manual training has not been able to cover the whole human being on the one side, it has covered the "Sucker," or the local forms, on the other.

You have noticed that no two methods are just alike, no two statements of results are just alike in detail; and the upshot of it all—and that is an important thing for us to remember—is that all manual training is as yet in its tentative and experimental period. We have got hold of the principle: we are pretty sure of that. I myself have

been trustee of the Cambridge Manual Training School for three years. We have seen it from all points of view. We have looked at it all over the country, and we recognize that the whole thing is as yet only half developed. We must go away with that understanding, that each locality has got to work it out in detail for itself, to try its own experiments, avail itself of its own failures, take its own material, use it as it can, and by and by it will be developed into something like a cohesive and systematic form, as our regular high-school training may be said to be by this time, where men are working on the same lines and know what those lines are. In manual training we are all working experimentally.

When Mr. Rindge decided to establish the training school at Cambridge, our superintendent, Mr. Ellis, went to all the training schools of the country and came back with the conviction that no two were alike, and that we must work out our own school upon its own lines and upon no general average. That was a most important result. I feel sorry that circumstances prevented us from making any exhibition of the school's work here. It grew out of the circumstances connected with the health of our principal, who was already overworked. You will do a great deal better by taking an hour to-morrow and going to see the school itself than by any amount of exhibition here. As the leading experiment in the neighborhood of Boston, it is, in my opinion, of the greatest value.

There is another point, another conclusion to be drawn, which covers a much wider field. I think that we must all feel that the view of manual training for itself alone would be only a very narrow way of looking at it, and that we cannot know what it is or what it is going to be unless we see it as a part of that great system which is gradually transforming all our educational methods, making them, one by one, not necessarily more practical in the ordinary sense, but more in accordance with the principles of human nature. By introducing fresher life, fresher methods, we make study a more real thing than it used to be. That application is seen in the introduction of gymnastic training in its various forms, in the introduction of the elective system in colleges, and in the introduction of manual training. What does all the gymnastic training date back to? To a period which I can almost remember; for it was a class two years before my own in college, where a prominent member of his class, subsequently a lawyer and a judge, was charged with the then serious offence of actually, without having the fear of God and the President before his eyes, owning and manipulating a row-boat of his own on Fresh Pond! Well, the lawyer being strong in him, he called the attention of the faculty to the point that there was no direct prohibition of a boat by the college laws. But he found his match in a young professor,—who was undoubtedly a distinguished lawyer afterwards,—who pointed out the fact that, although there was in the statutes no direct prohibition of a boat, there was a distinct statement that no student should keep a domestic animal without permission of the faculty; and he argued that a boat was a domestic animal within the meaning of the statute. Now our whole modern gymnastic training dates back to that condition of things, and it has gone on till it is almost too absorbing in our colleges.

Our training under the elective system is another advance on a parallel line. The old system of memory recitations, of getting every day something learned by hard study for the sake of reciting, has given way to original research and study, after the German method of allowing and encouraging the student to actually do something for himself. I often think with wonder, as I live there in Cambridge, and the young men come to consult me about the theses they have to get up on some intensely interesting subject,—I think what bliss it would have been to me, when I was in college, to have been allowed to do just this thing. Original research, which was then considered almost a crime, now receives marks and scholarships as the highest virtue! The same principle comes in there that comes in in gymnastic training, that comes in in manual training,—the substitution for mere routine work or for the sole training of memory of “something attempted, something done that earns a night’s repose,”—as our townsman Longfellow writes of his village blacksmith.

When I go into our manual training school and see the boys there absorbed in their work, not looking round on the sly at the visitor as in other schools, too busy to care whether the visitor comes or not, I ask myself, Why is this thus? I do not believe it is merely because manual training is so much more interesting than any other work the boys can do, but because it is presented to them in that form of an actual achievement, something to be accomplished by themselves under general directions, but still in their own way. And the better and more thoughtful the boys are, the more easily are they interested.

There is one great delusion that needs to be banished,—that this manual training is going to be a panacea for turning lazy into industrious boys, or worthless into virtuous. Nothing of the kind. The boys that came to us the first year were sent too much on that principle. Just as boys in my boyhood were sent to sea if they gave trouble at home, under the impression that living in the society of similar ne’er-do-weels would bring out possibilities of virtue that had heretofore slumbered, so some boys were at first sent to our school on that principle. It was only gradually that we got anything like picked material. There are single instances where a stupid boy in his books has become the bright boy in the manual school; but, as a rule, the boy who does well in his lessons in the grammar school and the high school will do well in the manual training school. The same qualities of energy, persistence, ambition, that come in to the high school, will come in elsewhere, too. Mr. Hill, the master of the High School, or Mr. Bradbury, of the Latin School, can tell pretty well in advance what the boy whom he sends to the manual training school will do there. If he was a shirk in one place, he will be in another. If he will lie and cheat in one place, he will do the same things in another. There is no panacea for transforming a boy by merely giving him a new work to do. But the fact that something is attempted, something is done every day, that is the benefit of manual training. That is the thing which makes manual training schools so attractive to those who have anything to do with them.

A great deal has been said about how much good has been done to the pupil. Nothing has been said as to how much good they have done the trustees: I can represent that point, however, in my sphere.

President Walker has probably had the same sort of experience in the Institute of Technology. I do not doubt the boys, on the whole, have done him more good than he has done them! Bret Harte says that the best way to educate yourself well is to educate your great-grandmother. So with regard to manual training schools, educate the trustees; take men who, like myself, were trained in the old classical *régime* and loved it through and through,—no boy loves his work more than I loved and always love my Latin, Greek, and mathematics,—take a man educated that way, and gradually open his eyes to the charm of appealing to this other interest of the boy's nature. I go about among those boys, watching their work, carefully guarding against asking too many questions for fear they shall ask me some in return, very sure that I could not do the least of the things that I can joyfully watch them doing, and I share the enlightenment that pervades the whole thing. I began with limited faith in it. General Walker will remember how he and I prepared a report for the State Board of Education when neither of us knew as much as we do now, in which we limited ourselves rather carefully to the barely educational aspect of manual training. I know that I have now gone on to see much more than the educational aspect of it. I have seen the elevation of labor, which once I did not believe could be got by manual training schools, gradually come in my own little community. I have seen among the boys of Cambridge a steadily increasing respect for dirty hands, and this to me is one of the most encouraging signs of the age. I have seen how at first the boys of the training school were a little looked down upon—indeed, a good deal looked down upon—by the boys of the other high schools. I have seen how it gradually grew in popularity. I have seen a picked class from Harvard College actually glad of the opportunity of being trained there, and of having their hands equally dirty. I have seen this year the leading private school in Cambridge, a school for boys, injudiciously, as I think, kept by their parents out of the public high schools,—I have seen those boys come of themselves, and ask as a favor to come in and soil their hands also, to put on the regular school dress and go to work with the others. That is, we have seen the manual training school achieve what we did not succeed fully in accomplishing in our high-school system,—a mingling of social conditions under its roof.

I agree thoroughly with every word that has been said about the education of girls in that connection; and that is to me the great drawback of our manual training school at Cambridge, that it is exclusively masculine. The one comfort I have is that the same boys go to school with the girls during part of every day, in their high-school work, and I hope are handsomely eclipsed by them in their recitations. I have no doubt that sooner or later we shall have a manual training school for girls.

I want to call your attention to one striking fact with reference to the foot-ball playing of the boys of the manual training school last autumn. Our superintendent, who is one of those men whose eye penetrates the innermost nature of a boy,—there is nothing in the outer or inner make-up of a boy that our superintendent, Mr. Ellis, does not comprehend: he is one of those men so fond of boys that

when we send him away for a vacation, to get him away from them, he takes two or three along to help him enjoy his solitude,—this superintendent called my attention to this fact. Our boys have played, I suppose, thirty games with other schools, accompanied by all the severities of the season. Sometimes they beat, sometimes they were beaten; but the point is this. Mr. Ellis says that in almost every one of those games our boys made their score in the second innings, and not in the first, and that in almost every instance the boys who played against them, from the high to the grammar schools, made their scores in the first innings, and not in the second. What is the explanation of that? I find two explanations: in the first place, that the physical training our boys have in the manual training schools gives them a physical endurance beyond that of the boys who have had only intellectual training; and, in the second place, that the habit of having a certain end before them and definitely working toward that end, the end of "something attempted, something done," gives them a habit of perseverance that they would not otherwise have. They are like Paul Jones, who, when asked, Are you ready to surrender? replied, No, we have not begun to do our share of the fighting. Our boys do their share of the fighting in the second inning; and in that respect as in others they show that manual training has something in it that works upon all the aspects of their nature, that it takes them as whole human beings. And this gives us, in combination with the other points of progress that I have described, a hope for the future and something to look forward to that makes us glad, on the whole, that we are living in the year 1891 instead of half a century earlier in the development of our educational systems.

Adjourned.

Last Session.

Saturday Morning, April 11.

The closing session of the Conference was called to order at ten o'clock by President Walker. The following paper was read by Professor Simon N. Patten, of the University of Pennsylvania:—

THE VALUE OF EDUCATION RELATIVELY TO THE CONSUMPTION OF WEALTH.

BY PROFESSOR SIMON N. PATTEN.

Poverty, suffering, vice, and crime are afflictions which mankind has had to endure from the dawn of civilization, and the search for their causes has always occupied a large space in the speculations of every age.

Perhaps the most simple way of accounting for their existence is to say that there is a lack of productive power, and thus make the niggardliness of nature the cause of the social misery. Many economists accept this premise, and look for a gradual decrease of these evils through the increase of productive power resulting from the growing supremacy of man over nature. They accept the simple but incorrect theory that every increase of productive power adds to wages, and thus reduces the suffering of mankind.

To the great majority of investigators this simple theory seems defective. They see that the amount of misery and suffering is conditioned by other factors than the physical environment, and seek elsewhere for their real cause. When the question of the cause of poverty was first asked, the most natural answer was that the tax-gatherer was the cause of the trouble,—that what the people produced was taken away from them. But, when the evils of an oppressive taxation were in a measure done away with, still misery and crime and poverty remained. People now necessarily sought for some new answer to this problem.

The next thought was that the evil lies in the government itself, and that all our trouble came from the way in which the government oppressed the people and kept them from doing what they desired. As a consequence, for a long time this thought was emphasized in national affairs, and statesmen tried to give each citizen that equality and liberty which are necessary for his development.

Mere liberty, however, did not give the results that were wanted. So men turned to a new reason, and the emphasis was laid upon production. It was now seen that the difficulty lay largely in the quantity of goods produced. It was not enough to satisfy the reasonable

demands of all the people, and consequently the emphasis of the older economists was naturally laid upon production.

We now have that increase of productive power for which the early economists sought. We have had it in many respects increased three or four hundred per cent., and yet the same problem stares us in the face as before. Poverty, misery, and vice still continue, and often seem to have increased with the growth of productive power.

At a later period the emphasis was changed from the production of commodities to their distribution. It was hoped that some scheme could be devised by which the lower classes could get a larger share of the gross products of industry. Many economists still hope for relief from such measures, yet I am becoming more and more conscious of the fact that the real ground of the difficulties that retard social progress does not lie in the manner in which the wealth of the nation is distributed.

Now, where is the real difficulty of the problem in question? Let us take the matter up as we find it in our every-day life. Suppose that we want bread. If we go out to the Western farms, we find the work of raising the wheat carried on scientifically. Great savings have been made in harvesting the grain and in getting it into condition for the market. Other economies have reduced the cost of handling it in the warehouses to which the farmer takes it. Our millers make better flour from it at less expense, and the railroads have greatly reduced the cost of getting it to the consumer. The greatest care is taken that there should be economy in every direction until we pass the flour over to the consumer. Then our care over the matter—all that watchfulness which has thus far been exercised—ceases. The question now arises, What does the consumer do with it?

We have a false notion if we think that, because we can watch an ignorant and careless person in his production, and keep him from wasting, we can do the same thing in his consumption. He is left to himself there, and what he does is simply the following out of his own inclination. The barrels of flour that we have carried so carefully to him are left for him to use as he will, without that supervision that directs him in production. The process of waste begins, therefore, just as soon as it comes to his hands, and before it is turned into food. In a great many cases, by far the larger part of the whole product that we have so carefully produced for him has been wasted. Suppose we go to any of the houses of the laboring people and see what part is actually rendered valueless through their carelessness and ignorance. It is no exaggeration to say that half of the food supply in any of our large cities is thrown away or wasted. Why is it? Simply because that great care which has been taken in controlling the production of each article ceases entirely when it comes into the hands of the consumer. In their houses people do not keep up that economy which they use as producers.

If these facts be true, and the trouble in our system lies in a lack of efficient supervision in consumption, we shall not solve the difficulties which stand in our way until we make a study of this problem as it relates to the laboring classes when they act and live by themselves, when they are not under the care and guardianship of some

more intelligent person than themselves, as they are when they are producers. We must take up the problem in question, and see why it is that these persons do so much to destroy the very product that they have worked so hard and so systematically to produce. What is the trouble? As we have increased our productive power, as we have reduced the waste of production, we have increased the waste of consumption; and what we have gained on the one hand we have been losing right along on the other hand, by overlooking the fact that all these commodities which we have been so carefully producing pass into the hands of persons who are in no wise competent to decide what to do with them.

Let us take another illustration to show what I mean,—the production of shoes. Every scrap is cared for as long as the productive process is going on; but as soon as it comes into the hands of the consumer, the laboring man, the shoes soon become worthless, simply because, when he goes to a retail store to buy a shoe, he is prompted by the wrong class of motives, and obtains a shoe which is not fitted for his purpose. He has not the foresight to select the better class of articles instead of the poorer class. If we go into any store, we find that those articles which are in great demand are the very poorest and cheapest articles, which will only satisfy a demand for the present. The whole energy of the people is set in the direction of trying to get the best possible way to produce shoes; and yet we have had poorer and poorer shoes put on the market for the last fifty years. Every part of the shoe is poorer than before; and, as a result, we have simply lost in consumption what we have gained in production. This seems to me the simplest answer to the question asked in the beginning of this discussion. People are looking merely upon the increase in productive power, and so do not see why, with this increase, they should not have a corresponding increase in consumption; but they are forgetting all the while that these very things have been put more and more into the hands of persons who are less competent to care for them in consumption.

Take the difference in the condition of families a hundred and fifty years ago, when production was on a small scale as compared with now. The apprentices and journeymen were living in the family, and care and forethought were exercised in each part of the production and consumption of every commodity. All supplies for the family were bought in large quantities, and the housewife was careful and prudent in their use. But what has been the state of things in later times, when we have separated the journeymen from the family life of their employers, and they must live by themselves? Such small quantities of every article are demanded to supply these families that the cost of getting them is much increased, and then a class of persons come in to do the cooking who belong to a much lower class in society than formerly.

Take our servant problem as compared with that of foreign countries. Why is it that we are so much worse off? Our servants come from a class of society that are not prepared to be good cooks and do good work. They come from European countries, perhaps where they have worked out of doors, and try to do our cooking. Just such changes as that have been going on in the working class ever since

the introduction of production on a larger scale. There has been as a result a rapid increase of waste on the part of those who have the preparation of food in hand.

The defects in the education of the public as consumers show themselves just as plainly in the care of clothing as of food. The difficulties of our present condition in relation to clothing lie to a large degree in the fact that our people do not know how to mend their clothing. If we have a society in which the average person does not know what to do when the garments worn by the family need repairing, it simply means that they will use the cheapest kind of garments they can find, to get along, if possible, without mending. Take a simple thing like stockings. The problem of the average man seems to be to get a stocking that will wear out so quickly that he does not need to have it mended. When it is defective in one part, it will be defective in every part, and there is not much loss if he throws it away. In this way, we have the character of our whole industrial life changed from what it otherwise would be. The demand for cheap articles compels us to produce the very cheapest garments, because the laborers lack the knowledge of how to care for them.

It is not by doing some one great thing that we can make social progress. It is not production on a large scale to which our attention should be directed, but to a thousand little things. Production touches a man simply on one side. It is an educative force, but it is simply at some one point. Some one faculty is called into activity; but the problems of consumption touch him on every side, and our hope lies in creating in him habits of consumption that will modify every part of his nature. Here is the place where we can get at him; and it is this kind of education which will lead to his development, because it creates in him a demand for everything which is better and nobler than what he has at the present time, and gets him in the habit of doing a set of things which are essential to his further development.

I once asked a commercial traveller who, like others of his class, was always in motion from place to place, how he managed the problem of clothing. He replied that by having only one business suit he never let the quantity of his clothing accumulate. When a garment became defective, he bought a new suit of clothes, and left the old suit in his hotel. This seems an easy solution of a difficult problem, yet a closer examination will show that it is a costly one. The garments of our middle and upper classes must harmonize with one another in color, cut, and material. To discard a pair of trousers because of a rent means also to throw away a coat and vest. A slight defect in the clothing of our friend, therefore, meant that he should divest himself of his outer clothing almost as completely as a snake does of his skin. I do not mean, of course, that all our people of the higher classes are as wasteful as this friend; yet, if any one will reflect how many of our garments are a source of satisfaction to us only when they form a part of a harmonious group, he will have an object lesson on the costly waste that results from the degenerate notions and defective education of the present age.

The waste of ignorant consumers is seen in all their actions. We

have introduced many new processes to produce our sugar more cheaply. The greatest care is taken to increase and to economize the total product as long as it remains in the hands of producers. Give it over to the consumers, and the economy ceases. Half of the table sugar is wasted because people are ignorant. They do not know that only a certain amount of sugar can be held in solution in a cup of coffee or tea. They throw into the cup three or four spoonfuls, when only a small part can be dissolved in the fluid. They also put double the quantity of sugar on all the articles they wish to sweeten, because they do not understand that sugar must be dissolved in the mouth to have a sweet taste.

Let us go to the kitchen for another illustration of ignorant waste. The makers of our stoves and furnaces have exercised much ingenuity to give us an oven that will have a good draft and a fine heating capacity. Our miners and railroads have also greatly reduced the cost of getting coal to the kitchen. Here is a fine opportunity for our cooks to continue the economy of natural forces and prepare our food with but little cost. Yet, instead of bringing their actions in harmony with other producers, they counteract the previous economy through their ignorance of how to control the draft of the furnace. They use six buckets of coal a day, when two would do as well, if they had the intelligence and forethought of the careful housewife. The strong draft carries one-third of the heat up the chimney, a second third escapes into the room to make its occupants miserable, leaving the remainder to do its work less efficiently than if the greater part had not been wasted.*

A Philadelphia phenomenon will form my final example. In the newer parts of the city there is a great activity in building operations, while in some of the older parts almost every house is for rent. I inquired for the cause, and found that it lay in the cheap and defective houses that have been recently built. When a house has been occupied a few years, the walls, floors, partitions, and sewerage are so defective that the family prefer moving into a new house rather than attempting to repair the old one. What can be done for a house whose walls are cracked, the joist rotten, the doors warped, and the floors so defective that only heavy carpets can shut out the death-giving draught? Did you ever think that we use more carpets than all the civilized nations combined simply because of the defective material and workmanship in our houses? It is, therefore, easy to see why the better classes avoid trouble, misery, and disease by moving into the newer parts of the city, leaving for innocent strangers the death-traps in what are really the best parts of the town.

With these facts before us, need we ask what is the effect of the recent increase of wealth due to social progress? It permits us to

*The very large range in the Tennyson Street Cooking School was, during the last school year, ready to cook any of the dishes that might be prepared by the pupils, from half-past nine in the morning until half-past four in the afternoon, for five days in the week, for thirty-eight weeks. Fires were made, the dampers and drafts were controlled by the pupils, under the direction of the teacher. The amount of coal consumed in this time was considerably less than two tons. Now, if any unhappy householder here present will compare this expenditure of fuel with what takes place in his own kitchen, he cannot fail to be impressed by a sense of the prudence, patience, care, forethought, intelligence, and skill involved in keeping up such a service at so small a cost. If this be not educational, pray what is education? — *President F. A. Walker.*

waste and throw away more wealth. It enables us to have poorer clothes, eat poorer food, and live in poorer houses than our ancestors did. It allows us to have our pavements so cheaply made that we can afford to have them torn up next year. It also permits us to make a living in spite of the doctors' bills and funeral expenses which result from poor water, filthy streets, and obstructed sewers. If we produced less, we could not afford these luxuries.

If we recognize that the difficulty lies in this condition of affairs, what can we do to remedy the evil? It is right here that we have an educational problem of the greatest importance, and the solution lies in bringing our ordinary people to understand and appreciate more fully than they are doing at the present time where the difficulty lies and how to remedy it. They do not now know how to do differently. They do not know how to make those savings which are necessary. We need to give them an education that will fit them to perform the domestic duties that modern society has thrown into their hands. It is simply impossible for us to attempt in any efficient way to exercise a supervision over them in their household economy. We must educate them along these lines to care for themselves, and see to it that these various economies are made in their domestic life.

This problem has a vital connection with the whole technical and industrial education of our nation. We need an education which leads people to care for what has been produced. Here is a principle which we have so far entirely overlooked. It is something toward which the attention of economists as a class, and the public at large, must be more and more directed as time goes on.

The welfare of the laboring classes, as a whole, depends upon their standard of life. What articles are going to be in this standard of life? They will be those articles which give the greatest surplus of pleasure over the labor taken to produce them. Whatever gives this larger surplus of pleasure will form a part of the standard of life of the people. If bread gives a greater surplus, the people will be a bread-eating people. If in some way we can give to meat as great or nearly as great a surplus as bread, then meat will become a part of the standard of life. Increase the number of articles that give a large surplus of pleasure, and the standard of life is raised, and a better position can be secured by all the laboring class.*

Now, why do we not find more articles in the standard of life of our laborers? Is nature so adverse that it will give but few articles that yield a large surplus in consumption? No: the trouble does not lie in nature. We have an abundance of articles, but do not use them properly. The articles of food which ought to be in the standard of life of all the people are not there simply because they do not know how to cook them. Our country is a country of fine vegetables and fine fruits; and yet, because the people do not know how to cook them, they are not used to anything like the extent which they should be. In going about the country from one place to another, we find that it is just the few simple things which the people know how to cook properly which form their standard of life. The other articles of

* See the writer's "Consumption of Wealth," chapter vi.

the food supply are not utilized. The farmer who grows eighty acres of corn or wheat and tends them with care often lets his garden grow up to weeds. In a land luxuriant in all forms of vegetable life he lives on bread, pork, and potatoes. That the diet of city and village people is little better is shown by the small area used for other purposes than the staple crops. I once lived in a village of 1,500 inhabitants where two men produced all the vegetables used except potatoes. We fail to realize the grand possibilities of our environment, because we are ignorant of the ways in which our food products can be made nutritive and edible.

In better economy of what we produce we have a key to our industrial problems; and here, more than anywhere else, our practical endeavors can produce results if we work up the matter systematically. Give the laborers an education of the kind which will have a direct influence upon their consumption, and the solution of other educational problems will be much simpler than it now is.

I do not mean to say that material results are the only ones we should work for. We certainly want a great many more and higher things than material forms; but, until we have attained that progress that will result in giving to every person in a community a high standard of material comfort, it is impossible to get that further progress which we all desire for them. This is the beginning; and, when we get so far, then we have society lifted to a plane from which individuals have a point of view which will enable them to see for themselves what to do to better their condition still more. But we must get them out of the present rut into which they have fallen, and American society needs this kind of education more than any other.

In the Old World, where they have the great army system on the one hand, and on the other hand the industrial life with its great productive forces, why is it that in modern times the army officer has had so much greater effect in elevating the people than the employer? The development that is going on in Europe comes largely from army life. Why is it that the army more than anything else has remodelled the whole Italian life? We cannot answer this question without seeing what army life does for the soldier. While in Germany, I went one morning to watch a company of artillery as they came out to drill. In the first place, all the men brought out their horses, and the preparation began. Every man did his part with care, and looked over everything to see that all was in place. The corporal came along and examined everything, and found a few things out of place; and then the lieutenant and, finally, captain came along and did the same. Every detail was examined into by all these officers, to see that it was just right and in perfect order.

Now, what effect did that have upon these men? It made them careful about everything they did. Their whole life from the time they start in the army until they leave it is a system of inculcating regular habits into the soldiers. The men are moulded into new beings by the influence of these army officers, who, of course, have a special purpose in mind, which perhaps is not economic. It does, however, have an economic effect, because it touches the men on every side. Before a man leaves the army to go home, he has adopted a new way of living; and what he has acquired in the army

he applies everywhere. It becomes a question which every employer asks, "Have you served in the army?" The answer to this question more than any other tells whether he is a man of regular habits or not. Of course, in saying this, I do not have any thought that we should have an army system to bring about this result. We ought to bring it about in a better way. The teacher in America must do that which the army officer has done with such great success in Europe. It will only be when the teacher touches the pupil on every side that he will do the work which the army does. Just as soon as our school life takes hold of the pupils in that thorough, systematic way in which the army officer takes hold of the new recruit, then, and only then, shall we have that educational development for which we all hope.

Let us, in closing, return for a moment to that troublesome question from which we started. What is the cause of the poverty, misery, and vice from which society suffers, and where is a remedy to be found? A late and popular reply to this question is that the trouble lies in our land laws, and the remedy in making land common property. But how can we make land common property? Not by giving each family a few acres, but by producing enough food on the land to supply the needs of all. To have enough food for all depends not on the quantity produced, but the use we make of it. The quantity of food a given area will supply depends less on the men who harvest the wheat, hoe the potatoes, husk the corn, and tend the stock, than it does on those who prepare these articles for the table. We shall make land common property not by taking it, but by making wholesome food common property. And, to make food common property, we must make the art of cooking common property. We shall make corn common property by teaching our cooks how to make good bread from it. Wheat will become common property only when soggy, heavy bread ceases to be seen on our tables. We shall not make meat common property until all parts of an animal can be properly prepared by every cook in the land.

Perhaps I should go too far if I should claim that by making the art of cooking common property we could remove the poverty and misery for which a remedy has so long been sought; but I at least feel prompted to assert that, when we become as efficient and careful in our consumption of food as we are now in its production, we shall no longer be troubled with those grave problems that now surround our food supply. An education of the public as consumers must accompany their education as producers if we wish to secure that adjustment of society to its environment which will give us the least of poverty, misery, and vice, and the most of liberty, happiness, and morality.

The following paper was then read by Professor J. D. Runkle of the Massachusetts Institute of Technology:—

THE ORIGIN OF MECHANIC ART TEACHING: ITS INTRODUCTION INTO THIS COUNTRY.

BY JOHN D. RUNKLE.

The paper which I have been asked to read contains nothing new either of fact or of theory. What is here presented is just what all know who have had any occasion to look up the subject. My aim has been simply to bring together, as briefly as possible, the main facts involved in the origin of mechanic art teaching, and its introduction into this country.

Any proposed scheme of reform, to be successful, must be well adapted to produce the desired results, and must also come when the conditions are favorable for its success. In short, the proposed system to succeed must be needed.

This seems to me to be especially true of the educational reform which has come through mechanic art teaching. We shall see that this reform grew out of the necessities of the case.

While instruction in the mechanic arts does not constitute the whole of industrial training, it is yet so fundamental and so large a factor in all such education that we may well regard it as the corner-stone of the structure, or the key-stone of the arch.

It is true that forms may be delineated with the pen, the pencil, or the brush, as in the graphic arts; or impressed upon yielding substances, as in the plastic arts; or woven into textile fabrics; or cut out of harder materials, such as wood, stone, and the metals, with such implements or tools as are adapted to the particular purpose, as in the mechanic arts.

But in any complete system of industrial education, regarding both the educational and industrial ends, which are only one when rightly considered and pursued, all form study finds its application in the mechanic arts, and thus, ultimately, through the practical applications of these arts, into the manufacturing industries.

That mechanic art teaching is now considered as a great and far-reaching educational reform cannot be doubted.

That it is so considered by the public is shown in the rapidly increasing number of manual training schools springing up in all our large cities, by the efforts which are being made to introduce the simpler forms of mechanic art teaching into the lower grades of the public schools, and also in the change of opinion which has taken place among the leading teachers of the country. Nor is the time far distant when, in all centres of population, or of industrial activity, mechanic art teaching will be as much a matter of State control as are the schools themselves.

It seems proper, therefore, that we should consider the origin of this important reform, with the attendant circumstances and conditions.

As we already know, the credit of devising and working out a thoroughly rational and consistent course of mechanic art teaching is due to the Imperial Technical School of Moscow, Russia.

But, before speaking of this system, and the conditions out of

which it grew, I wish to call your attention to one or two points in this connection.

The Polytechnic School at Carlsruhe in Baden, Germany, one of the oldest, and for many years the leading school of its kind in that country, made its great and well-earned reputation by especially developing the department of mechanical engineering.

The leader in this great work was Professor Redtenbacher, who was one of the first to base the problem of machine design and construction on firm scientific grounds.

In order to combine practice with theory, as is now done at the Institute of Technology, shops were established in which the students should be taught the theory and use of the hand and machine tools employed in construction.

But for some reason, and in all probability because no well-devised system of teaching had been worked out, these shops soon fell into disuse for all purposes of instruction. In 1880 I saw these shops in the basement of the school building, but they were used only for making repairs about the buildings, and for apparatus.

The sentiment in all the polytechnic schools of Germany has always been strongly opposed to anything like shop or hand instruction as a part of the engineering courses, and I was informed that this opposition had mainly grown out of this early failure at Carlsruhe. But it is certain that these schools consider a knowledge of practical hand-work of the utmost importance to the success of the young engineer. Most of them demand that the student shall have had shop practice before entering the school, or shall, after completing his course of instruction, get this experience before receiving his diploma.

In the first half of this century another grade of schools was established, which should be termed trade-schools, or schools for teaching the practical and technical details of some special manufacturing industry. They did not attempt to produce mechanical engineers, but skilled workmen, who should be qualified to take leading places in manufacturing establishments.

Schools of this type are based upon the idea of apprenticeship in teaching, and therefore of manufacturing, as a function of the school; and, under certain conditions, and in some industries, this is clearly the most practicable and feasible course.

This means the education of a class for some special pursuit. Conditions which demand and justify such schools already exist in large sections of our own country, as well as abroad; and these conditions will extend if our public school education shall not be so modified by the introduction of the industrial element as to render unnecessary any further special preparation for entering any department of industrial life.

We now come to the Imperial Technical School of Moscow, Russia, which was founded in 1830, and was in its inception distinctly of the trade-school type. A large manufacturing plant was connected with it as a part of its means of instruction. The students entered the manufactory as apprentices, and were taught hand-labor as apprentices usually are in such works.

The system of teaching the rudiments of handicraft through manu-

facturing was continued until 1868. This long experiment of thirty-eight years, conducted on a large scale and under the best conditions, had proved the system a failure, both educationally and economically.

I propose now to give an account of the reorganization of the shop instruction in this school substantially in the words of its director, Mr. Victor Della-Vos, as given at the Philadelphia Exposition. He says: "In 1868 the school council considered it indispensable, in order to secure the systematic teaching of the elementary mechanic arts, and for the more convenient supervision of the pupils while so employed, entirely to separate the school workshops from the manufacturing works, in which orders from private individuals are executed, admitting pupils to the latter only after they have perfectly acquired the principles of practical labor.

"By the separation of the school workshops from the mechanical works, the principal aim was, however, far from being attained. It was found necessary to work out such a system of teaching the elementary principles of the mechanic arts as should require the least time for their acquisition; should make the instruction progressive, and facilitate the supervision of large numbers of pupils; should impart to mechanic art teaching the character of a sound and systematic acquisition of knowledge; and, lastly, should facilitate the testing of the pupil's progress from day to day. Every one is well aware that the successful study of any art whatsoever, such as free-hand and linear drawing, instrumental music, singing, or painting, is only attainable when the first steps are strictly subject to the laws of gradation and succession, when the student must adhere to a definite method, surmounting little by little, and by certain gradations, the difficulties to be overcome.

"All the arts which we have just named possess a method of study which has been well worked out and defined, because, as they have long constituted a part of the general education of all well-instructed classes of people, they must have become subject to scientific analysis, and objects of investigation, with a view of defining the conditions which should render the study of them as easy and progressive as possible.

"This is, however, by no means true of the mechanic arts, a practical knowledge of which has become of as much importance to the educated engineer as to the skilled artisan.

"These arts are carpentry and joinery, wood-turning, pattern-making, casting, forging, and hand and machine tool-work in the metals.

"From what we have already said, it will not be difficult to see why a strictly systematic method of mechanic art teaching should have been so long delayed, nor why the working out of such a method should need the aid of intelligent and specially trained minds.

"To the knowledge and experience in these special arts of those intrusted with the management of the school workshops, and to their warm sympathy in the matter of practical education, we are indebted for the drawing up of the programme of systematic instruction in the mechanic arts, and its introduction in the year 1868 into the school workshops, and also for the preparation of the necessary auxiliaries to systematic teaching.

"In the year 1870 the school exhibited its methods of teaching the

mechanic arts at St. Petersburg, and since then they have been introduced into all the technical schools of Russia."

It will not be necessary for me to give a catalogue of the sets of tools and models for carrying out this system of instruction in the mechanic arts, which were exhibited by the Moscow School at Vienna in 1872, and again at Philadelphia in 1876.

It has always been to me a matter of surprise that this remarkable exhibit at Vienna should not have made a more marked impression, and led to more immediate and more important results in Europe.

But our surprise should be lessened, perhaps, when we remember the fact that not a single report on the subject of education made in this country did more, so far as I know, than barely refer to the Moscow exhibit at Vienna, without the faintest intimation that there was anything of any special novelty or importance involved in it.

In 1874, two years after the Vienna exhibition, the mechanic art school at Komotau in Bohemia was established by the Austrian government. This work was intrusted to Dr. Theodore Reuter, now director of the mechanic art school at Iserlohn, Germany.

As he was charged with the duty of deciding upon the scope and plan of the school, his first work was to study the methods at that time in use in all parts of Europe.

This study led to the adoption of the Moscow system of mechanic art teaching, and it was not until after the introduction of the same system into the Institute of Technology in 1876 that I became aware of the Komotau School. I saw the Moscow exhibit again in Paris, in 1878, after its methods and merits had become widely known, and were having a marked, if not acknowledged, influence in modifying old systems, particularly in France, as was evident in the exhibits of some of the French industrial schools.

We now come to the Moscow School exhibit at Philadelphia in 1876, and the effect it has had upon mechanic art teaching in this country since that date.

It is now well known that the distinguishing feature of the scheme of instruction in the Institute of Technology, as set forth in its plan of organization, was a proper combination of the theoretical and practical in all its courses of study.

This plan brought the laboratory system of teaching in all departments of the school into special prominence, and necessitated a careful and continuous study of the methods adapted to each particular case.

The chemical laboratory led the way, and laboratories in other departments followed as rapidly as the proper method to be pursued in each case could be fully and definitely determined.

The proper plan of practical instruction to be followed in the department of mechanical engineering early became a matter of grave concern.

But few students entered the department with any practical knowledge of shop-work in any manufacturing industry. Their courses of instruction gave them the scientific theories involved in machine designing and construction, with fair skill in mechanical drawing, but with no practical knowledge of hand-work or such shop experience as would give them the standing of an ordinarily skilled mechanic in any manufacturing establishment.

The result was that our graduates in this department, as a rule, found all the avenues leading into industrial life closed to them, except perhaps in the designing department of some manufacturing works, where they might perchance find a place to do mechanical drawing when a vacancy offered. But this position gave them almost no opportunity to become acquainted with the practical details of other parts of their profession; and, without exceptional ability in designing, they found their professional progress beset in all directions by grave and discouraging difficulties.

For a graduate to be obliged to enter a shop as an apprentice, to learn the alphabet of the practical side of his profession, seemed to be a grave defect in his education, which we were in duty bound to correct. To do this, there seemed but two courses open to us,—either to require a knowledge of practical hand-work for admission to the Institute or to furnish the student the opportunity for this instruction during his course of study.

It needed but little reflection, however, to see that the first plan was entirely impracticable. He could only get the shop practice, which he would need as an engineer, in some manufacturing establishment of the proper kind, which he must enter as an apprentice, and work under the most unfavorable conditions; and even this poor opportunity would be denied him when it was known that he intended to leave as soon as he began to be useful to the establishment. It thus became plain that this defect, if met at all, must be met by the Institute. Naturally enough, the first impression would be that, if the Institute should furnish this opportunity, it could only be done by establishing such a department of manufacturing as would provide the desired facilities; that is, the Institute must assume the manufacturing function for the purpose of furnishing the proper instruction for its students.

This plan seemed to us to be out of question, both on educational and economical grounds, and was never for a moment regarded as practicable or desirable under any circumstances or conditions.

It had not been found necessary in any other department to invert the true order of educational development, and it was confidently expected that the true solution of the problem would sooner or later be found in this department also.

It was in this expectant and hopeful frame of mind that we went to the Philadelphia Exposition in 1876. It was quite natural that our first interest should be in the foreign educational exhibits; and it did not take long to become convinced that we had at last found the true solution of the vexed problem of the kind of laboratory needed to complete the course of instruction in the department of mechanical engineering.

A report upon "The Russian System of Shop-work Instruction" as exhibited at Philadelphia was submitted to the corporation of the Massachusetts Institute of Technology on Aug. 17, 1876, with the recommendation that it be adopted. The same report also recommended a "two years' course in practical mechanism," to be known as "The School of Mechanic Arts." Both of these recommendations were adopted by the corporation. In this report it was said that in all constructions a certain limited number of typical forms

are found, these forms being more or less modified to adapt them to special constructions. These forms also fall into groups, each to be worked in a certain way and with special tools,—considerations which lead at once to the mechanic arts.

The ideas involved in this system are: first, entirely to separate the mechanic art *instruction shops*, or *laboratories*, from the *construction shops*, or manufacturing works; second, to do each kind of work in its own laboratory; third, to equip each with places and sets of tools to accommodate as many pupils as a teacher can instruct at a time; and, fourth, to grade the work in each course in accordance with its underlying principles. In short, in these preliminary instruction shops, the *arts* which find their application in construction are systematically taught. This report closed by stating that the endeavor had been to set forth as clearly as possible the general considerations upon which this system of laboratory instruction was based; to show that the solution of the problem had been approached from the instruction, or educational, side, and in this consisted its fundamental and thoroughly practical character, as part of a system of general education; and that it was equally well adapted to the wants of each class or grade of students.

Further, the system applied equally to all industrial arts needing manual skill. With such shops once established, we should also be prepared to offer instruction to a class of pupils to whom such a systematic training, properly supplemented by other studies, would prove a valuable foundation for further study or for some business pursuit.

It was this consideration, in addition to the fact that we needed the means for maintaining these shop courses, which led to the establishing of the School of Mechanic Arts. This was distinctly a manual training school, founded on practical instruction in those mechanic arts which apply in all constructions in wood and the metals.*

Measures were at once taken to carry out the plans and recommendations which had been adopted by the corporation. The first need was a suitable building for the shops involved in the scheme of instruction. It was decided to erect a temporary one, and this work was entered upon without delay. About the first of November, 1876, parts of this building had become ready for occupancy. In the mean time the question had to be considered as to which of these several shops should first be established.

There were two main considerations which seemed to determine the matter. The first involved the elements of time and expense; and the second, which course offered the best test of educational value and efficiency for a class of young men of mature age, who would enter upon the course with zeal and determination, as being an important part of their professional training.

This course was decided to be hand-work in the metals. It demanded the finest results, and offered the severest tests of accuracy and skill. This shop was followed by others as fast as they were needed by the students, and the whole series was completed in the early part of 1877-78.

* On account of the increasing demands of the engineering departments upon the shop facilities, and also of the fact that the School of Mechanic Arts had outgrown its usefulness as a part of the Institute of Technology, it was recently discontinued.

Full details of these courses may be found in the Forty-first (1876-77) and the Forty-fifth (1880-81) Annual Reports of the Massachusetts Board of Education, to which those interested are referred. The papers relating to this subject, entitled "The Manual Element in Education," contain seventeen full-page illustrations of shops, tools, and shop-work courses, relating to mechanic art teaching in the Massachusetts Institute of Technology, and set forth the educational value and details of the system.

It will hardly be necessary for me to trace the growth of mechanic art teaching in this country since its introduction into the Institute of Technology in 1876. Then it was practically unknown, and but few believed in its value or ultimate success. The seed which was planted in faith and hope has already brought forth many fold, and is gradually spreading to all parts of our country. Its great value as demonstrated in Manual Training Schools and in the higher grade Polytechnic Schools is to-day beyond question.

The forms and the spirit of this teaching are gradually working downward into the public schools, where the needs of industrial education will always be supreme.

In these lower grade schools the great mass of our children will begin and end their preparation for the duties of life. When labor, both mental and manual, becomes honest, intelligent, and self-respecting, all distinctions as to kind and degree will gradually disappear, and all will work together for the common good. During the last half-century, in particular, the industries have marched with giant strides,—strides with which the schools have not kept pace.

Of this fact, and of the necessity of infusing into our schools the industrial spirit, we are just becoming fully aware.

The inertia of any great system of public education is immense, and well it is that it is so; but, when the social forces have once overcome this inertia, in ever so small a degree, the movement is destined to grow with accelerating speed. The exhibition now in this building is an inspiration and pledge for the future. To all the friends of mechanic art teaching, and of all forms of industrial education, I tender hearty congratulations.

The following resolution, offered by Superintendent S. T. Dutton, was unanimously adopted:—

Resolved, That the Conference of educational workers returns its sincere thanks to the school committee of Boston for its courtesy in granting the use of the English High School for the purposes of this meeting; to the press of Boston for the fidelity and accuracy shown in the full reports of the proceedings; and to all who have contributed to the success of the Manual Training Exhibition of 1891, either by the preparation of exhibits or by taking part in the discussions.

Rev. C. G. Ames was asked to make the closing address.

Mr. AMES.—I believe that Professor Runkle, who has just sketched for us the rise and progress of mechanic art education, was among the very few who saw in the Russian exhibit at the Centennial Exhibition, fourteen years ago, the significance of what was there to be seen, and how it might be made effective by being grafted into our American system. During the present week the people of Bos-

ton have had an admirable opportunity to look on an exhibit of the products of manual training, which might be as suggestive of what is to come in the future to many thousands of our citizens as the Russian exhibit was to Professor Runkle. I think no parent in Boston could walk through these rooms without wishing "my boys" and "my girls" might have an opportunity to acquire such powers and faculties.

But such work goes slowly ; and the first and most important thing is to clear the subject not of practical failures in respect to methods, but of errors in respect to the theory. At the opening session on Wednesday Dr. Samuel Eliot, who presided, struck the true note. He lifted manual training above the mere processes by which boys and girls may be trained to get an honest living into the region of pure education, and I think few of the speakers have missed that emphatic note.

We are all of us utilitarians by necessity, but there are all grades of utility. Some see clearly the lower ranges, while others see the higher. The pot must boil, and there must be something to put in it, if the masses of mankind are to have their daily dinner ; and there is no objection to considering the economic value of industrial training or any other kind. Indeed, it becomes vitally important ; and the presentation made by Professor Patten belongs in a vital way to the whole subject which has been presented during the week. "We have grown in wealth faster than we have grown in wisdom," is a saying of the ex-President of the Philadelphia Board of Education, James S. Whitney. Mr. Gladstone says that more wealth has been produced in the nineteenth century than in the eighteen centuries before. But this vast amount of wealth has not turned to a corresponding result in human happiness. Professor Patten showed one reason for this in that our attention has been given to the production of wealth and the means of acquiring it rather than to wise uses of it by consumers.

But we must keep all truths together, that all human interests may advance with equal step. Emerson says, if we drop anything on the way, we have got to go back for it. In pressing manual training, we cannot afford to drop industrial training nor literary training. But there is a great difference between fashioning a human being as a piece of machinery to be used in industrial production, and educating him to be a completer human being. Yes, the pot must boil, and there must be something to put in it, or we shall go hungry ; but it is quite an item in the whole scheme whether there shall be a population worth feeding. We are all utilitarians, but the higher utilitarianism says : Seek first the humanity of man, and all other things will take their proper place under that and as subordinate to it. It is important that the public mind should be cleared of misapprehensions sufficiently to see the higher utility along with the lower.

It is not possible, I think, that we should get the best results out of manual training unless we continually hold manual training as one contribution to human advancement, regarding it purely according to its educative value. This has been the key-note of this Conference,—a note which needs to be heard far and wide, and which it belongs to each of us to take up and try to propagate.

What happens to the boy who uses a tool that does not happen when he uses a book? The feel of the hammer handle is something; and, whichever nail he hits, he learns something. A double action takes place both in his imagination and without. Not only does that stroke take effect on the nail, but on the mind. It takes effect on every faculty employed in the action; and that is not a simple, but a complex matter. The best part of our education comes not so much from knowing as applying knowledge to action. A writer on kindergartens says, "The world is sick of knowing: it must be saved by doing." No, we do not know any too much yet; but we must *do* better. The richest and most fruitful application of knowledge comes from doing, and can only come from doing.

Manual training is not simply a provision by which the children of the poor shall be put in the way to make a living and be serviceable to the community. Is a child born with a golden spoon in his mouth? That is no reason why that child should remain a baby or become a booby. As much as the children of the poor do the children of the rich need to come into possession of their real faculties. The children of the rich need manual training as truly as the children of the poor. They should all have the highest use of their faculties. A man who can do some worthy thing, whatever it is, counts among the forces of the world; while he who can do nothing is a good-for-nothing. To *think* is to do something, however; and none of us are in danger of undervaluing mental power. But what the advocates of manual education claim is the immense re-enforcement of the power of the mind, as the result of a wiser direction of the power of the hand.

I can do no more than point a finger at the illustrations which crowd this building, to ask the people of Boston, and of Massachusetts, whom this audience represents, to take up and continually propagate that divine note which exalts humanity and uses the forces of humanity only to impel it toward its appointed perfection.

After thanking the speakers who had contributed to the success of the meetings, General Walker declared the Conference adjourned.

APPENDIX.

The following circular was issued by the committee and sent all over New England and to a few cities in other parts of the country where manual training has been in operation for many years :—

NEW ENGLAND CONFERENCE OF EDUCATIONAL WORKERS.

MANUAL TRAINING EXHIBITION.

In connection with the Conference on Manual Training, to be held in the English High School, Boston, there will be an exhibition of all kinds of manual work that can be represented by making and drawing from the Public Schools of New England. It will embrace all grades from the Kindergarten to the Technical School. The exhibition will include

I. Pupils' work.

II. Classes at work under the instruction of their teachers.

It is hoped to make the exhibition complete and representative in character without calling upon teachers to do special work for it. With this end in view, specimens may be selected that fairly and creditably represent the scope and quality of the work done during the present school year, as follows :—

I.— Pupils' Work.

1. *Kindergarten*.—The occupations of paper-folding, cutting and pasting, mat-making, stick and slat work, sewing, clay modelling, etc.

2. *Primary and Grammar Schools*.—Color work; drawing, free-hand and mechanical; clay modelling; construction, including paper, card-board, and wood-work; map drawing and making, of paper, cards, cloth, clay, putty, etc.; and sewing.

3. *High Schools*.—Drawing, free-hand and mechanical, including pictorial, constructive, and decorative work; modelling, map-making, and home-made apparatus.

4. *Evening Schools*.—Free-hand drawing; outline, light and shade, and modelling; mechanical, geometric, machine, architectural; naval drawings and blue prints.

5. *Manual Training Schools*.—Drawing and construction; sloyd, joinery, metal work, illustrative and experimental apparatus.

6. *Technical Schools*.—Drawing and construction work from State Normal Schools, Art Schools, Schools of Design, and Technological institutions.

II.— Classes at Work.

1. Kindergarten.

2. Sewing.

3. Drawing.

4. Modelling.

5. Cooking.

6. Sloyd.

7. Joinery.

8. Metal-work.

Representative classes from several schools will occupy the rooms assigned for these purposes, and will be engaged in work under the instruction of their own teachers, according to a programme to be issued later.

Instructions as to the details of mounting, transmitting, and displaying the work, and directions as to the arrangement of the classes, will be sent to those wishing to contribute or take part.

Several cities, towns, and institutions, through their representatives in the Association under whose auspices the conference and exhibition are to be held, have signified their intention to participate, so that undoubted success is assured. The limitations of space are the only embarrassing elements in the arrangements.

It is hoped that the progressive work of the schools may be represented, and to this end Superintendents or Directors are requested to communicate as early as possible with the committee, giving information as to the kind of work they wish to exhibit and the amount of table and wall space desired.

The general arrangements and the superintendence of the classes will be in charge of the chairman of the committee. Miss L. B. Pingree—address, The Oxford, Boston—will superintend the Kindergarten Department. Mr. Henry T. Bailey, North Scituate, Mass., will have the management of the Drawing work. Mr. John O. Norris, principal of the Charlestown High School, will have charge of the other exhibits. Communications relating to the several departments will receive the careful and prompt attention of these members of the committee.

GENERAL ARRANGEMENTS.

The class and lecture rooms of the English High School, Montgomery Street, will be assigned to the several places and institutions contributing.

The assignment of space to those applying will be made by this committee. All exhibits will be set in place by the contributors under the direction and subject to the rules of the committee. Exhibits must also be taken down and packed by contributors.

The exhibition will be open Thursday, Friday, and Saturday, April 9th, 10th, and 11th, from 9 A.M. to 10 P.M. on Thursday and Friday, and from 9 A.M. to 12 M. on Saturday.

All exhibits must be delivered at the English High School, Montgomery Street, on Monday, April 6th; and nothing will be received for which space has not been previously engaged.

C. E. MELENEY, Somerville.
HENRY T. BAILEY, North Scituate.
MISS L. B. PINGREE, Boston.
JOHN O. NORRIS, Melrose.
M. T. PRITCHARD, Boston.
A. H. KELLEY, East Boston.
HENRY HITCHINGS, Boston.

HENRY W. POOR, Lawrence.
MISS L. E. FAY, Springfield.
MISS ABBIE M. WHITE, Providence.
MISS JESSIE N. PRINCE, Quincy.
MISS M. T. HALE, Boston.
MRS. M. T. MEARS, Boston.
MISS ELLEN GRAY, Boston.

MISS MABEL HOOPER, Boston.

Committee on Exhibition.

Approved by the Executive Committee of the N. E. Conference of Educational Workers.

EDWIN P. SEAVER, *Chairman*.
JOHN O. NORRIS, *Secretary*.

The places and institutions which accepted the invitation of the Conference were assigned space as follows:—

First Floor of the Building.

North Bennet Street Industrial School.
Comins School, Boston, wood-work.
Warrenton Street Sloyd School.
Private school, Marlboro Street, Boston.
Blind Asylum, sloyd-work.
Schools of Brookline, Mass., Manual Training.
Springfield Manual Training School.
Wilmington (Del.) Manual Training High School.
Philadelphia Manual Training High School.
Eliot School, Jamaica Plain, 9th grade.
Montclair (N.J.) Manual Training, intermediate grades.

Pratt Institute, Brooklyn.
 Massachusetts Institute of Technology.
 Northampton, Mass., Manual Training Grammar Schools.

Second Floor.

Chicago Manual Training School.
 Public Schools of Washington, D.C.
 Young Women's Christian Association, Boston.
 Drawings from Public Schools of Quincy, Mass.
 Exhibit from United States Military Academy, West Point.
 Drawings from Public Schools of Springfield, Mass.
 Kindergarten work from Boston and Cambridge.
 Manual work from Workingman's School, New York.
 Drawing from Dover, N.H.
 Drawing from Holyoke, Mass.
 Drawing from Clinton, Mass., and Portsmouth, N.H.

Third Floor.

Exhibit of Public Schools of Somerville, Mass.
 Drawings of Public Schools of Lawrence, Mass.
 Drawings of Public Schools of Worcester, Mass.

Drill Hall.

Drawings from the Evening Schools of Boston, Springfield, Waltham, Mass., Pawtucket, R. I.
 Elementary manual training work from the Boston Public Schools.
 Drawing from George Putnam School, Boston, and Wells Memorial School.

Library and Adjoining Rooms.

Sewing from Public Schools of Boston, Cambridge, Somerville, Springfield, Mass., and New York City.

EXHIBITS.

THE NORTH BENNET STREET INDUSTRIAL SCHOOL.

This is a private enterprise, carried on in the interest of public education and social reform. It is supported by the annual and occasional contributions of a few persons, and is under the direction of the following Board of Managers:—

Mrs. QUINCY A. SHAW, <i>President.</i>	
Miss LALIAH B. PINGREE.	Miss ELLEN MASON.
Miss PAULINE SHAW.	Miss LUCIA M. PEABODY.
Mrs. N. P. HALLOWELL.	Miss A. C. PUTNAM.
Miss JANE H. NEWELL.	Miss M. T. HERSEY.
Mrs. FRANCIS S. FISKE, <i>Secretary.</i>	
TUCKER DALAND, <i>Treasurer.</i>	

In the year 1885 an order was passed by the Committee on Manual Training of the Boston School Board, granting permission to pupils to accept the offer of Mrs. Quincy A. Shaw to receive manual training in the North Bennet Street Industrial School, "provided that parents of pupils should so request."

Cooking, housekeeping, and laundry work were offered to girls, printing, carpentry, and shoemaking to boys. To these clay modelling and Swedish sloyd were afterwards added. Housekeeping was combined with lessons in cooking, while laundry work was found to be impracticable.

From that date, 1885, until the present time, classes from public schools have been regularly received here, during school hours and under school discipline, for weekly lessons during the whole school year.

Over one thousand such public school pupils received manual training here during the school year of 1890. Between three and four hundred more were members of summer classes of the Vacation School. The conditions of this undertaking have been such that, in addition to giving good training to this large number of boys and girls, it has been possible to do some valuable experimental work in various directions. Cooking and Swedish sloyd are conspicuous instances of successful experiment. This school has also served as a perpetual object lesson and laboratory for the public benefit, in which has been found not a little of its value. Students of the subject of manual training have been constantly invited to study and to criticise the work; and this invitation has been widely accepted. That by its means persons have been helped to reach satisfactory conclusions is seen in the fact that manual training movements have been started in various suburbs of Boston, and in many other parts of New England, whose first impulse was received at the North Bennet Street School.

Educational carpentry, both after the Russian and Swedish systems, modelling in clay, cooking, printing, and work in leather are all carried on at present with full classes. But, while it has been found possible to employ educational methods in the last two courses, it is not thought that these should be urged upon the school curriculum. Sewing is an important part of the work of Vacation School during July and August, and together with dressmaking is also a feature of the evening work, where

classes of adults, as well as children, are found in many of the departments. All instruction is free except that of a few evening classes of adults.

As a result of this tentative work, the managers of this school are unanimous in the conclusion that manual training is an essential feature of the elementary education of all children, and that the use of wood-working tools, with intelligent teaching, will be found effective in securing mental and moral results similar to those characteristic of kindergarten methods. It is also believed that the physical refreshment and invigoration incident to this work is likely to result in a more sound and sane condition of body and mind than is common in the schools of to-day.

Much thought has been given to the needs of the great numbers of boys from nine to twelve years of age who fill our public schools, especially for those condemned to a life in city streets, with its tendency to dwarf, mentally and physically, all that is generous, useful, or manly, and to propagate, with an awful celerity and uniformity, a vicious "smartness," whereby a little education often becomes a source of danger to the community.

Testimony from school-teachers to the value to such pupils of the training received here is abundant and enthusiastic. Some of these teachers, both men and women, have applied a double test to the value of the work by taking a course of instruction in the manual training classes with their pupils.

The exhibition from this school included drawing and wood-work after the Russian system, modified by the class teacher, B. F. Eddy, and adapted to the boys over thirteen years of age.

The work of classes in wood after the Swedish sloyd system, modified for American needs by Lars Eriksson (teacher), and adapted to the capacity of boys of over nine years of age, also a preliminary course of manual training in paper for primary grades by Lars Eriksson.

Good work in clay modelling was also shown, done by classes of girls from the Hancock School from twelve to fourteen years of age, and of boys from the Eliot School of from eight to twelve, under the instruction of Mrs. F. M. Holland, assisted by Mrs. Blanchard.

Remarkably good results, both manual and moral, have been obtained from this work in clay with young boys and with those from the ungraded classes who are exceptionally backward in their school studies. This is regarded as a striking illustration not only of the value of manual training to such pupils, but of the power of good teaching, and serves in this case to emphasize the important truth that the success of manual training is perhaps more dependent upon the psychological insight and teaching ability of the class instructor than is often the case with other branches of education where an intellectual result is more manifestly demanded.

The name of this school is a misleading one, but is retained as an inheritance from earlier days, when the methods of the institution were more philanthropic than educational.

Philanthropic and social work still has a place in this large undertaking, which reaches, by its ministrations by means of the work of the evening as well as the day, the summer as well as winter, more than two thousand persons annually.

THE SCHOOLS SUPPORTED BY MRS. QUINCY A. SHAW.

Sloyd, or the Swedish System of Manual Training (in this case with wood-working tools).—The aim of this work is the mental, moral, and physical development of the pupil, the manual training and skill being regarded as a means, not an end.

It is due to the unfaltering faith of Mrs. Quincy A. Shaw in the educa-

tional value of manual training, and to her constant efforts to further its introduction into general education that a very interesting exhibition of manual work was made possible, filling four large rooms. This work was done by boys of from eleven to fourteen years of age, at the North Bennet Street Industrial School, the boys coming from the Eliot School, Boston, and from four schools in Somerville; also at the Comins School, Roxbury, the private school at No. 6 Marlboro Street (where both boys and girls are having this training), and at the Sloyd School in Warrenton Street, including the work of Brimmer School boys and of normal classes. Class work was also shown in these rooms from the "Horace Mann School for the Deaf" and from the Westboro Reform School. Remarkable work was sent from the asylum at South Boston, done by the blind, for whose special needs very ingenious adaptations of the sloyd system have been made by Mr. Gustaf Larsson, principal of the Sloyd School in Warrenton Street, Boston.

In these rooms it was shown that instruction in Swedish sloyd is to-day enjoyed by several hundred pupils of the public schools of Boston and suburbs, and that one hundred and sixty normal pupils, mostly teachers, are receiving instruction in mechanical drawing and tool-work (sloyd) at the free school in Warrenton Street, established by Mrs. Shaw. Here every effort is made to lead normal pupils to the study of the philosophy of manual training as well as to a knowledge of good methods of instruction, and thus to protect the cause from its chief danger, merely mechanical work, and the loss of what is best in it,—namely, the cultivation of the creative imagination, the exercise of judgment, the strengthening of the will, with other mental, moral, and physical results,—all largely dependent upon the mastery of the whole subject by the teacher.

From these normal classes teachers have gone out (in addition to the schools already mentioned) to the Lyman School at East Boston, the Young Women's Christian Association, and to some private schools and classes.

The introduction of sloyd has proved in many ways an interesting and valuable experiment, enabling those interested in public education to make a practical test of the quality of a new system without the use of public funds; and it is believed that this will lead to a more general and thorough study of a subject which is quite too little understood.

The fact that an industrial value is, at first, more apparent in the sloyd than is the case with some other systems, is misleading, and has sometimes been prejudicial to it in the estimation of superficial observers. Students of the subject, however, have found that the emphasis laid upon the employment of articles of use as models is justified by the keen interest and consequent mental activity which the making of such models excites. It is found, also, that educational principles are not sacrificed to the utilitarian idea, the *exercise* being always the first consideration, after which the useful object is sought, in the making of which the desired exercise or series of exercises can be given. It has been abundantly proven that a moral awakening and a legitimate self-respect are the natural outcome of this employment of the creative powers of the pupil in having made a genuine contribution of value to the home. It is by means of these higher moral "uses" that the "useful" model of the sloyd will commend itself to educators.

RICE GRAMMAR AND APPLETON STREET PRIMARY SCHOOLS.

Finnish Elementary Sloyd and Swedish-American Sloyd.—The Finnish elementary sloyd was introduced into all the grades of the primary school in the year 1889-90. In 1890-91 a second teacher was employed, and the

Swedish-American sloyd was introduced into the new room. Instruction has been given during this year to the sixth grammar and first primary grades. The main object of this experiment, supported by Mrs. Hemenway, has been to find out whether it be practicable to employ special teachers of sloyd and make the work compulsory, without too heavy expense and without detriment to other work as the curriculum is at present arranged.

ELIOT SCHOOL, JAMAICA PLAIN.

The Eliot School is a private school, supported by a private fund, and is at present furnishing, under authority of the School Committee, instruction in manual training to such boys as can best be accommodated from the public schools in its vicinity.

The problem presented to this school in September, 1889, was to furnish instruction in manual training to classes of four grades, whose members had received no previous instruction in tool-work and who probably would not return for a second year. The experiment was therefore made of giving the same course to these four grades, thus furnishing a valuable comparison of the mental and manual ability of boys of different ages, as well as information on the subjects of application and interest.

The course used was an adaptation of the wood-work of the so-called Russian system or that usually employed during a part of the first year in the manual training high schools, and the boys to whom the course was given were from the first high and last three grammar years.

The work was done from correct working drawings, the last piece from drawings made by the pupils themselves.

The exhibit from this school was made to illustrate three distinct lines: first, the single year's course; second, the method of class instruction; and, third, the additional year's course. It was necessarily small, being confined to the results of experiments made during a period of less than two years, and consisted of specimens selected from the work of the several grades.

The work selected was arranged to show the single year's course, and from the high school included the following pieces: 1, exercise for the marking tools, rule, square, gauge, and bevel; 2, exercise in boring; 3, exercise in jointing and dowelling; 4, 5, 6, 7, and 8, five mortise joints; 9, halved joint; 10, chiselling exercise; 11, frame bracket; 12, box; 13, miter joint; 14, plain dovetail joint; 15, drawer dovetail joint; 16, small one-drawer cabinet. These were selected from the best four-fifths of the class. Time, seventy-six hours.

From the highest grammar grade the pieces were the same, with the omission of numbers 12, 13, 14, and 15, and were selected from the work of the better half of the class. Time, seventy-two hours.

From the second grammar grade the pieces were the same as from the first, but were selected from the work of the best two-fifths of the class. Time, seventy hours.

From the third grammar grade the pieces were from 1 to 11 inclusive, and were selected from the work of the best fourth of the class. Time, sixty-six hours.

The method of the school is class instruction; and one feature of the exhibit was the showing of the entire work of an average boy for the first fifty hours, and with it the work of the entire class on one of the exercises.

As the opportunity of returning for a second year could be given to only a few, the advanced work was limited. It indicated, however, that familiarity with the work brings not only greater ability, but added interest.

SCHOOL OF DOMESTIC SCIENCE AND INDUSTRIAL ARTS,

40 BERKELEY STREET.

The Boston Young Women's Christian Association, after twenty years of successful labor in behalf of the large class of young women who are wage-earners in the city, was persuaded that a great need existed which had not, so far as could be learned, been met by any organization in the country. It was the common experience of the Manager of its Business Agency to have some young woman of refinement, intelligence, and a good English education, apply for work, as reverses had overtaken her and she was obliged to become self-supporting. When questioned as to her qualifications, it was found that her education had been entirely theoretical, with nothing practical which would avail her now that she was left to fight the battle of life alone. She had no handicraft, no business training, no knowledge even of household work, and the problem which constantly recurred was, "What shall we do with these *useless* young women?" At the same time there was an increasing feeling that the direction of the American home demanded more intelligence and skill, and that house-keepers should be educated for this as for any other business. On the other hand, the growing interest in manual training led the Managers of the Association to see the time approaching when teachers would be needed in this new line of education. And in these two needs they found an answer to the problem of the Business Agency. In the spring of 1888 it was voted to open the School of Domestic Science and Industrial Arts.

Miss Helen Burns, one of the organizers of the school at No. 9 University Place, New York, which has since become a "College for the Training of Teachers," rendered most valuable assistance in forming a definite plan for the work. In September, 1888, the school opened with ten students, two of whom were graduates of State Normal Schools. The Department of Domestic Science was first organized, and placed under the direction of Mrs. E. P. Ewing, of Purdue University, Iowa. The course of study pursued in this department embraces cooking, the history, botany, and chemistry of foods, the practical care of a house, and the use of tools. In January the department of Industrial Arts was opened. Free-hand drawing, clay modelling, educational sewing, home dressmaking, and millinery were the studies pursued. Two evenings a week throughout the year were devoted to Physical Culture, and lectures on physiology, hygiene, and emergencies were kindly given by physicians. Lectures on "Chemistry of Foods" were given by Mrs. Ellen H. Richards, of the Institute of Technology, and on "Home-making" and "Housekeeping" by Mrs. D. A. Lincoln.

The school was conducted on the plan followed by many of the best boarding schools and colleges for young women, a certain part of the building on Berkeley Street being set apart for the use of the school, including kitchen, dining-room, parlor, class-room, and sleeping apartments. The students had methodical instruction in the care of these rooms, and actual practice in doing the work. It was also possible, without increase of expense, to allow the students the necessary practice in cooking and marketing; and each in turn had practical experience in keeping the family accounts.

The second year more class-rooms were set apart for the use of the school. Wood-carving, sloyd, and psychology were added to its curriculum. During the year it became evident that there would be a demand for special class work in both departments, and also that the course should be extended to two years, but admitting students for one year's course in either department.

Under these conditions the school reopened in October, 1890. Mothers became interested, and all available time and space were soon filled with

children's classes in sloyd and clay modelling. A class in the latter was also formed for teachers. These children's classes, with a model class in form study and drawing, give the normal students of Industrial Arts the opportunity for practice teaching; while the training school for servants, classes of working-girls, and church industrial schools give the same to the students studying Domestic Science.

The School of Industrial Arts made an exhibit of wood-carving, sloyd, form study and drawing, mechanical drawing, and educational sewing.

Wood-carving.—This exhibit consisted of a graded course, beginning with the Swedish Peasant or Geometric Style of carving, as the first and second stages, adapted to pupils in the middle grammar grades (6-7). The third stage was the Viking Style, in three steps, suited to higher grammar grades (8-9). This style introduces sweeping curves, with one depth of relief and a little modelling of surface in the third step. The fourth stage shown was the Byzantine Style of historic ornament, and is suited to high-school grades. The fifth stage was the Romanesque, and following were examples of Renaissance, and naturalistic treatment of plant form, carrying the scheme into work adapted to the artist's studio. This course in wood-carving was applied to a variety of articles, gathered from various classes taught by Mr. Rydingsvärd in the school and elsewhere. With the exception of two pieces, all the work was done by young ladies.

Form Study and Drawing covered the first four years of Prang's method in pencil work and the progression through the primary and grammar grades in clay.

First and second primary grades, the twelve type-forms and objects based upon them, with simple rosettes and leaves from nature. Third year, leaves from nature and copies of simple rosettes from Early English and French Gothic ornament. Fourth, fifth, and sixth years, single compound leaves and branches of simple leaves from nature, and conventional borders from copies. Seventh grade, Greek, egg and dart border from copy. Milkweed pod and seed. Eighth year, study of flowers from nature and copies. Study of pussy willow from nature, of Byzantine ornament from copies. Ninth year, study of animal from cast.—calf. Study of apples from cast. Original Viking design.

Sloyd.—Normal class work in Series I., adapted to fourth, fifth, and sixth years, Series II., to seventh, eighth, and ninth years, was shown. A set of mechanical drawings embodied a series of problems designed especially for normal classes in sloyd, beginning with a drawing from a simple block and ending with drawings from some of the more complicated sloyd models.

Educational Sewing.—Models made by the normal class, adapted to work from the third year through the seventh.

Third year.—Swedish method of teaching basting, running, overhand, hemming, stitching, button-hole, darning, and herring-bone stitches.

Fourth year.—Basting and overhand stitches on calico (matching stripes) and on plain muslin; running, stitching, overcasting, and hemming on unbleached muslin with red thread.

Fifth year.—Sewing bias seams and felling on unbleached muslin with red thread; gathering, sewing into band, and hemming on band; button-holes and sewing on button in bleached muslin.

Sixth year.—Folding narrow hems in paper, hemming narrow hem. Gusset-seaming, hemming, and catch-stitching on flannel. Darning on stockings and on cashmere. Setting patch in calico, matching stripes. Grafting.

Seventh year.—Tucking, hemstitching, whipped ruffling, square and mitred corners, chain and herring-bone stitches. Marking stitches, large and small.

Models of seventh year's work.—Night-dress, corset cover, and child's dress.

MONTCLAIR, N.J.

The exhibit from Montclair, N.J., embraced hand-work done at regular class exercises, either in the school-room or in the shop and modelling-room. A brief outline of the course pursued in the school will best describe the exhibit.

In the fourth and fifth years of school life, when ordinary kindergarten occupations are no longer suitable, pattern-making in geometric solids is introduced. The pupils are also trained to the use of the knife by the cutting of many natural and conventional forms from thin whitewood or other soft lumber.

In the sixth year all the pupils of both sexes take an advanced course in clay-modelling under a special teacher.

In the seventh year the boys are instructed in joinery in the school shop, while the girls engage in a course of sewing under the direction of the class teachers.

In the eighth year the boys are trained in both the American and Swedish methods of wood-carving. During the same year the girls are instructed in domestic economy, chiefly cooking.

In the ninth year the boys are taught wood and metal turning, drilling, forging, thread-cutting, and vise-work. The girls at the same time practise wood-carving.

Except as contained in laboratory work, manual training has not been carried into the high-school grades. All pupils below the high school devote at least two hours a week to hand-work.

In the Conference Exhibit all the above kinds of work were represented, with the exception of sewing and cooking. The exhibits of clay and metal work were especially noticeable.

BROOKLINE.

The School Committee of Brookline are in full sympathy with the idea that the best and broadest education is assured only when to the ordinary studies hand and eye training are added. As a member of that committee, Professor John D. Runkle has not only been an ardent advocate of the "New Education," but has personally directed the efforts made thus far to place the manual arts upon a permanent educational basis in the Brookline schools.

The theory upon which the committee are working is that hand-training belongs properly to every grade; that it should begin in the kindergarten, and proceed progressively through the primary, grammar, and high schools. This scheme is more comprehensive and liberal than that which admits the feasibility of working in grammar grades in such materials as clay and paper, but reserves all tool-work for the Manual Training High School.

We want the most nourishing mental food and the most universal forms of hand-training for the grammar schools. In no other way can we economize educational means, and give the masses that broad and liberal training demanded by present social conditions.

While the plant for manual training in Brookline is by no means fully developed, the several steps looking to that end are being taken as rapidly as discretion and good management will permit. A superb equipment for wood-turning at the Lincoln School, the opening of special rooms for sewing and cooking at the Heath School, and the employment of two additional kindergartners, are the additions for the past year.

Kindergartens.—The kindergartens of Brookline, like those of Boston and Cambridge, owe their origin to the energy, perseverance, and benevo-

lence of Mrs. Quincy A. Shaw. In July, 1877, Mrs. Shaw established the first kindergarten in Brookline, maintaining it at her own expense for the space of eight weeks, in two rooms of the Ward School, the use of which was granted her by the town. This experiment proving a success, the kindergarten was reopened October 1, in the old town hall, and continued there until June, 1882. Mrs. Shaw then transferred it (as the town needed the hall for a court-room) to a private house, occupied by her day nursery, where she conducted it for the next six years.

At the end of that time, having carried on the work for a period of eleven years, her long-cherished hope of seeing the kindergarten a part of the public school system was realized in 1888.

In September of that year (1888) the first public kindergartens in Brookline were opened in two primary school buildings, the Boylston and the Winthrop. In the latter was a kindergarten of fifty children, with two teachers; in the former, a kindergarten of thirty children, with one teacher, which increased in numbers the following year, and a second teacher was appointed. Both continue at the present time, with the recent addition of a third, known as the Auburn Street Kindergarten; and it is hoped that in time every district may have the advantage of this training.

[While there was no sewing exhibited in the Brookline room, this course was exemplified by classes at work.—Ed.]

Sewing.—During the present school year the work of reducing the lessons in sewing to a graded course has been accomplished. A sewing-room has been fitted up at the Heath School; and one teacher, with an assistant, has charge of the work there, as well as at the W. H. Lincoln School. Another teacher visits all the other schools weekly.

Following is an outline of steps in the several grades:—

Fourth year.—Threading needle; use of thimble; exercise of thimble-finger; position of needle against thimble, and pushing through cloth without thread; use of scissors; first stitches learned on canvas with worsted; basting; stitching; back-stitching; turning, basting, and sewing hems; over-sewing turned edges; beginning and joining of thread for these different kinds of work; questions on year's work.

Fifth year.—Position while sewing; review of last year's work; work done on pieces of unbleached cloth, nine inches by three inches, and all seams sewed with three colors of cotton to show joinings; two pieces of cloth basted together; stitching below basting; hemmed fell, turned with needle; running stitches, needle remaining in cloth throughout entire length; one-inch hem turned, basted, and sewed; button-hole practice commenced; edge of cloth turned straight and over-sewed to hem; running and back-stitched seam cut evenly and overcast; French seam; fell, the hem being turned with needle; patch prepared, basted, and hemmed on; patch prepared, basted, stitched in, and overcast; over-sewing selvage edges; gusset set in to selvage seam; tucks measured, basted, and run; gathering, stroking, sewing into binding; questions on year's work.

Sixth year.—Exercise of scissors on striped and checked cloth (stripes train the eye for cutting by a thread in fine cloth); exercise of thimble-finger; button-hole practice (cross-bar on outer edge in overcasting and straight bar on inner edge in finishing,—every part of button-hole work represented on blackboard); darning of all kinds: in stocking goods (hole darned on wrong side, small loops left to allow for shrinkage); in fine cloth; in worsted fabric, with ravellings; in silk and satin, with ravellings of same; in table linen, with fine linen floss; learning No. needle and No. cotton used for different kinds of work; sampler commenced (the sampler is made of fine white cloth, carrying out in white cotton the instruction given in lower grades on coarse cloth with colored cottons); cross-stitch made on canvas with worsted; questions on year's work.

Seventh year.—Sampler continued; single and double feather-stitch on canvas with worsted; herring-bone stitch on canvas with worsted (both

represented on blackboard); herring-bone stitch with silk on flannel; feather-stitching with silk on flannel; button-holes, different sizes, on sampler; button-hole on flannel with twist (button-holes cannot be practised too much); gathering, stroking, sewing on band; sewing on buttons; gusset made; sampler finished; hemstitching; Mexican work on linen; alphabet in cross-stitch, on scrim, with silk; length, width, and bias of cloth taught in this grade; questions on year's work.

Eighth year.—Embroidery darning; embroidery button-hole stitching, conching; French knot; outline stitch; outline upon original designs; advanced drawn work; harmony of color; primary cutting (drawers) by measurement from blackboard; intermediate cutting (skirt and sleeve) by measurement from blackboard; finish piece of work from this instruction for exhibit; questions and review of work done in lower grades; questions on year's work.

Ninth year.—Study of proportion of human form for cutting and fitting dresses; talks on dress materials; calculation for amount of material, of different width goods, needed for waist, skirt, sleeves, etc.; proper kind of lining for different dress materials; matching of plaids and stripes; first steps in dress-cutting; pin paper to model of girl's form, and cut out pattern; pin on sarcenet, or thin cambric, and cut out pattern; then pin on regular lining material and cut pattern; pupils taught to fit dress-lining to each other; pupil taught to represent in colored paper (from book of models) a perfect pattern of dress she wishes to make (this instruction leads to knowledge of designing); dress cut and made. Much of this work can be taught from blackboard (make it class work as much as possible). Gored skirt drawn and cut by measurement; questions on year's work; review of instruction given in lower grades.

Cooking.—When the W. H. Lincoln School was built, in 1888, a room was set apart for cooking, and it was fully established as a branch of regular instruction for the four upper classes.

During the present year a "school kitchen" has been furnished at the Heath School, and two lessons per week are now given to the girls in the three upper classes. The whole number receiving instruction at present is 128, the largest number in any class being 23, and the smallest number 14.

A course of study is in preparation. The first and second years' work will include the preparation of plain dishes, and detailed instruction in household economy. The work of the third and fourth years will comprise more advanced cooking (as salads and desserts), a review of the elementary course, and the chemistry of foods.

Mechanical Drawing.—The value of this branch of manual training, and the close relation it bears to shop-work, have been fully recognized. The work began with the highest grammar class, in the spring of 1889. A vacant room with ordinary desks, in the Lincoln School, was used for the purpose. Later regular drawing desks were made, and each was furnished with a set of materials consisting of a drawing board, T square, triangles, scale, compasses, liner, hard pencils, and eraser.

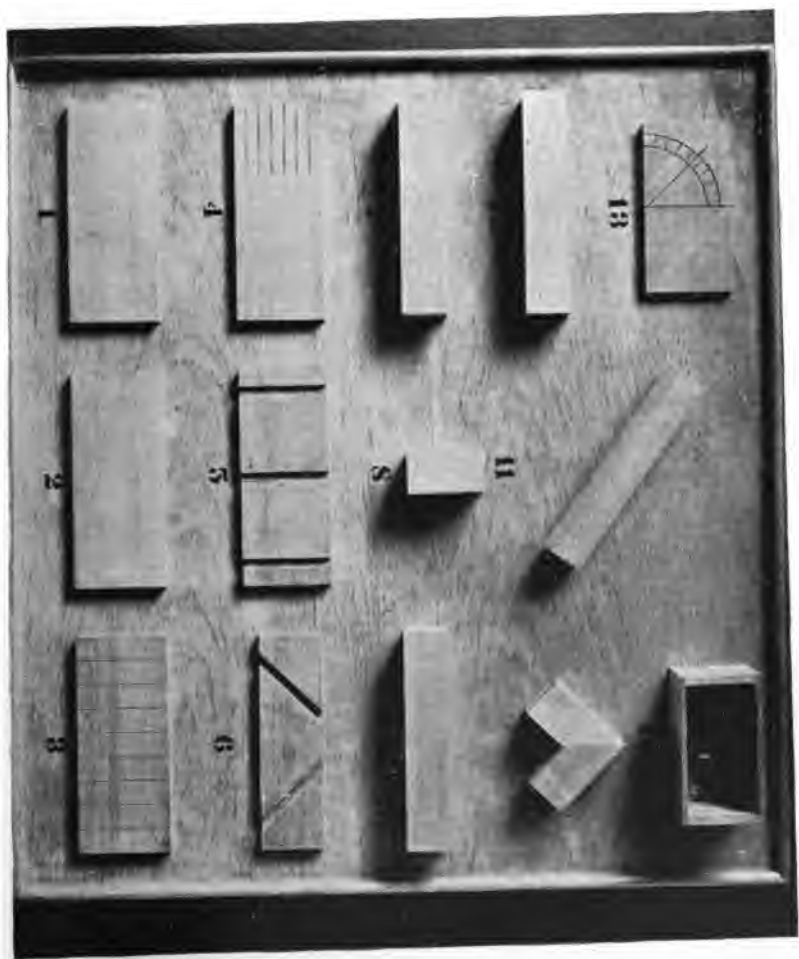
Since the building of the Annex, a room has been set apart there for the mechanical drawing. In 1889-90 the boys of the seventh, eighth, and ninth years of school, and in the fall of 1890 the boys of the sixth year, began this work. This year, 1890-91, is the first that the four classes have taken mechanical drawing.

While the boys of a given class are having a lesson in drawing or wood-work, the girls are at the same time receiving instruction in cooking or sewing.

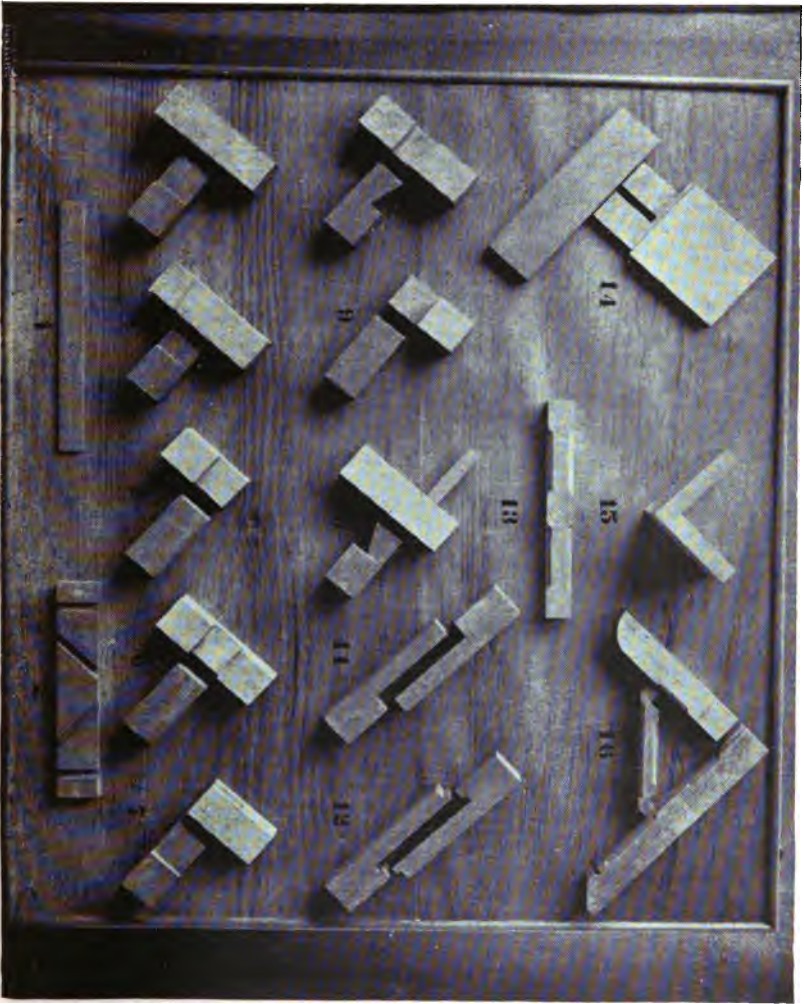
Wood-working.—In June, 1889, the exhibition of class work gave great satisfaction to the friends of manual training,—one of whom, Mr. W. H. Lincoln, pledged a considerable sum of money toward building an annex for manual training, provided the town would appropriate a stipulated sum. Prompt action was taken, and on Jan. 1, 1890, the annex was ready for occupancy.



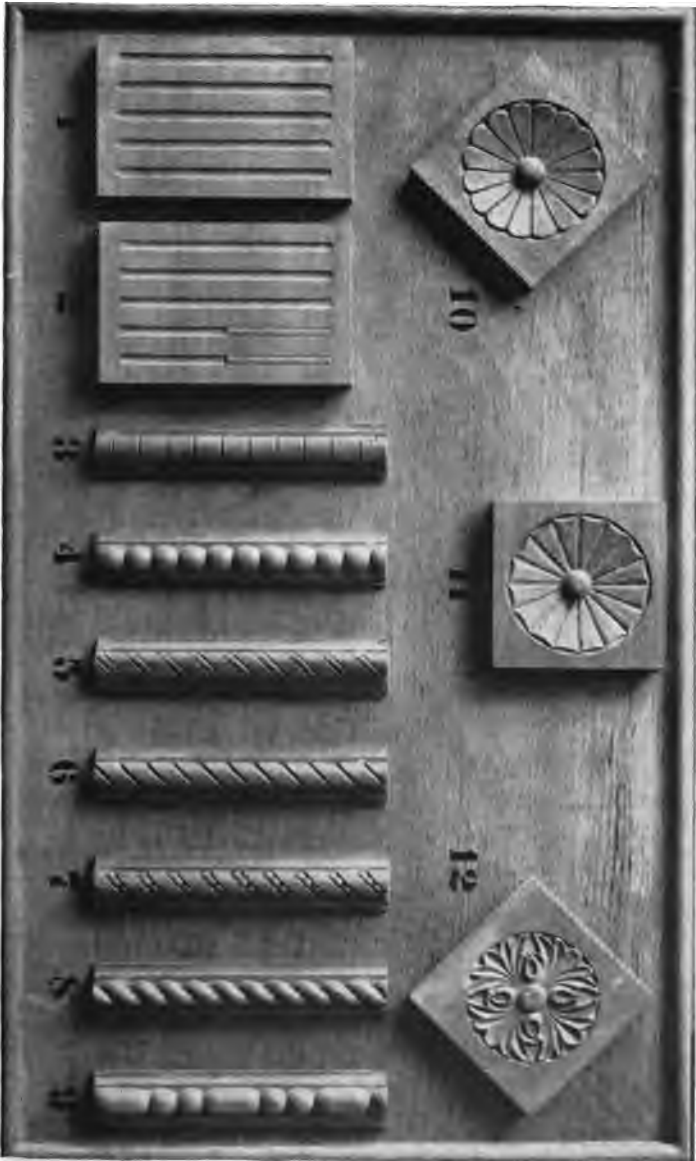
KINDERGARTEN, BOYLSTON STREET, BROOKLINE.



MODELS. — CARPENTRY. — BROOKLINE.



MODELS.—CARPENTRY.—BROOKLINE.



PATTERNS.—WOOD CARVING.—BROOKLINE.



CARPENTRY AND WOOD CARVING.—BROOKLINE.

MODELS.—WOOD TURNING.—BROOKLINE.





WOOD TURNING AND PATTERN MAKING.—BROOKLINE.

The structure is two stories in height. It covers an area of 40 ft. by 60 ft., with three work-rooms on each floor, and is connected with the main building by a covered bridge. In the autumn of 1890 the facilities were increased by the equipment of a room with 16 turning-lathes, and the same number of benches for pattern-making, together with a circular saw, a fret saw, and grindstone. Power is supplied by a Thomson-Houston motor of 15 horse power. This is located on the first floor, and is capable of running such additional machinery as may be needed in future. The rooms on the first floor will be used for those departments still to be established; viz., the foundry, the forge shop, and the machine-tool room. Thus a plant for manual training is here gradually developing that will be unique in its completeness and excellence.

Carpentry.—There are two courses in carpentry.

I. Elementary Course: 1. Use of gauge. 2. Use of gauge and try square. 3. Use of back saw. 4. Use of splitting saw. 5. Saw and chisel work at 90°. 6. Saw and chisel work at 45°. 7. Boring from both sides and meeting in the centre. 8. Boring from both ends and meeting in the centre. 9. Planing, sawing, and blocking. 10. Making a miter joint. 11. Making a protractor and marking the degrees to 90. 12. Making a box.

II. The Advanced Course: 1. Graduating a foot rule. 2. Square and miter work with saw and chisel. 3. Whole mortise and tenon. 4. Half mortise and tenon. 5. Half joint at end. 6. Half joint at centre. 7. Open dovetail. 8. Half dovetail halved. 9. Half dovetail. 10. Keyed dovetail. 11. Plain timber spliced. 12. Plain timber spliced, halved mortise at ends. 13. Chamfering. 14. Dovetailing section of drawers. 15. Double mortise and tenons for door. 16. Brackets embracing some of above joints.

Wood-carving.—This course deals with various forms fundamental to the art, and comprises beads, hollows, and rosettes, as indicated by the models.

Wood-turning.—The course includes some 14 pieces, as seen by the accompanying view of the models.

WILMINGTON, DEL.

The exhibit of the Wilmington Manual Training and High School was the product of a comparatively short period of time. It is therefore an evidence of the interest and enthusiasm which manual training creates among pupils.

The introduction of hand-training into the school is briefly told. The success which attended such schools elsewhere impressed itself upon a number of our citizens, and caused an investigation of this new feature of educational training. The decision was reached that the busy city of Wilmington could in no way better subserve its material interest than by the introduction of manual training into the high school, and the Board of Education was authorized to expend a sum not exceeding \$4,000 for a carpenter and metal shop for manual training of male pupils.

These shops were ready Oct. 14, 1889, and classes took possession with an eagerness which was a surprise to all, and furnished additional testimony in favor of the new departure. This interest has steadily increased, and is largely due to the manner and methods of its introduction. It took its place in the curriculum of the high school, carefully adjusted to the existing machinery. It was also decided to extend the privileges of the shop to every member of the school, and that the distinctive feature of a manual training school—the education of the mind, and of the hand as the agent of the mind—should be carefully kept in view.

It was not surprising, therefore, that the committee reported March 11, 1890, "that the introduction of the wood and metal working departments

has been attended with the most beneficial results. It has given a greater stimulus to study in all its branches, awakened a desire for and quickened the mental operations of the pupils in a marked degree. The increase of pupils in the high school by the February promotions has been large, with probable greater gains in the future and smaller losses from withdrawals of pupils than heretofore." In view of these facts, the committee was authorized to expend \$3,000 in fitting up a forge shop, pattern shop, and machine shop with the requisite power.

And one year after the introduction of manual training, Oct. 14, 1890, the school was in full operation as a manual training school. It will thus be seen that the major part of our exhibit was consequently the result of about one-half year's shop instruction.

The exhibit consisted, in addition to a few projects, of the following exercises, which at present constitute our course in shop instruction:—

Carpentry and Joinery,—saw and chisel exercises, the usual joints, mortises, etc., 18 exercises. Wood-turning,—10 exercises. Chipping, Filing, and Finishing,—10 exercises. Forging,—drawing out exercises, rings, etc., welding exercises, and tongs, 16 exercises. Pattern-making,—11 exercises. Machine Tool-work,—cylinder, regular curves, right and left handed screw, bolt and nut, etc., 11 exercises.

The following is an outline of the course as constituted at present:—

Junior Year.—Latin, English, Algebra, Physiology, Physical Geography, Drawing, Carpentry and Joinery, Wood-turning, Chipping and Filing.

Middle Year.—Latin, English, Geometry, Physics, History of Greece, Drawing, Forging, Pattern-making, Moulding and Casting.

Senior Year.—Latin, English, Trigonometry, Arithmetic, Chemistry, Civics, Political Economy, Book-keeping, General History, Drawing, Fitting and Finishing, and Machine Tool-work.

The shop periods are limited to ninety minutes daily, and, judging from our experience, are of sufficient length. In addition to the pupils of the high school, the sixth grammar grade also receives instruction in carpentry and joinery, but not daily. From the beginning pupils are taught mechanical drawing, and so far as possible work from their own drawings. All completed work is examined and marked by the instructor with the same care that is exercised in the written tests of the academic department.

It is somewhat early in the history of our experience to answer satisfactorily the question, "What have been the practical results of the introduction of manual training into the school?" There are certain things, however, which are too evident to be overlooked; and one of these is the large increase in the number of pupils. The first half-year class, entering February last, is nearly as large as the total membership of the high school was in 1888. The sixth grammar grade began last fall with 58 pupils, and, instead of decreasing numerically, it actually gained. The losses have been very small during the present year in all our classes, showing that there is no abatement of interest in shop-work.

The pupils also continue longer in school, so that we have larger classes in the advanced part of our course. This adds very much to the interest of the whole school. The effect of its introduction is also felt in the lower grammar grades, according to the testimony of teachers in those departments. These pupils strive to reach the grades in which hand-training is given, and are therefore more diligent in school work and are more regular in attendance.

Its influence in the academic department is also noticeable. Dull intellects are awakened by the new condition of things. The boys are more alert, and approach book-work with greater confidence in their intellectual powers. The methods in vogue in shop instruction necessarily add to the boys' ability to see things clearly, and to give reasons for the successive steps in the construction of a difficult exercise. Thus they learn instinctively

to approach, in the same logical manner, the problems, demonstrations, and experiments of the regular school work.

In conclusion, the success of the experiment thus far has fully justified the wisdom of the introduction of manual training into the high school.

PHILADELPHIA MANUAL TRAINING SCHOOL.

The exhibit of the Philadelphia Manual Training School illustrated as far as was possible the complete course of study as pursued in that institution.

In manual work there were shown the full series of exercises in chipping, filing, and fitting, forging, tinsmithing, moulding and casting, and artistic wrought iron-work; in wood-work, examples of joinery, turning, pattern-making, and wood-carving.

The constructive drawing included drawings for shop-work in wood and metal, projections, intersections, and developments, drawings of typical parts of machinery, together with isometric drawing, shading, etc.

Specimens of free-hand drawing from objects and simple casts in outline and light and shade, elementary and advanced geometric design in black and white and color, plant analysis design in black and white, with modeling in clay, illustrated the work in that department, which also included architectural drawing, plans, elevations, details, etc.

The application of drawing to other studies, physics, history, mechanics, etc., was illustrated by means of charts, and the method of instruction in these and other branches by students' note-books and specimens of work in portfolios.

Complete working electrical apparatus constructed by pupils was an interesting feature.

The essential characteristics of the exhibit were: first, every branch of the course of study was illustrated in one form or other, as a unit and in relation to other branches, with as nearly as possible equal prominence, and no one portion thrust forward for the purpose of making a mere display; second, every portion of the exhibit, including the frames containing drawings and charts, was the regular work of the pupils, and not selected specimens.

The Philadelphia Manual Training School affords to pupils who have finished the Grammar School Course the opportunity, not only to pursue the usual High School Course in Literature, Science, and Mathematics, but also to receive a thorough course in Drawing, and in the use and application of tools in the Industrial Arts.

The object of the School is the education of all the faculties. "The whole boy is put to school." He is trained mentally, physically, and ethically. An earnest effort is made to fit him to enter upon his life work without loss of time, and without error in the choice of occupation.

The Manual Training School is not a trade school, but it is a school wherein the *principles* underlying trades and occupations are taught. Its purpose is not to make mechanics, but to train boys for manhood. It is a fitting school for life and for living.

It fosters a high appreciation of the value and dignity of intelligent labor. Its moral influence is immediate and wholesome.

Its organization embodies suitable provisions for such purposes as practical education demands. These find expression in the following course of study:—

The combined course of study covers three years, and the school-time of the pupils is about equally divided between mental and manual exercises. One hour per day is given to drawing, two hours to shop-work, and three hours to the usual academic studies.

The course of study embraces five parallel lines, as follows:—

First.—A Course in Language and Literature, including the Structure and Use of English; Composition, Literature, History, Economics, and German.

Second.—A Course in Science and Applied Mathematics, including Geology, Physics, Chemistry, Physiology, Economic Botany, Mechanics, Steam Engineering, Applied Electricity, Mensuration, Book-keeping, and Surveying.

Third.—A Course in Pure Mathematics, including Arithmetic, Geometry, Algebra, and Plane Trigonometry.

Fourth.—A Course in Free-hand, Mechanical, and Architectural Drawing, Designing and Modelling.

Fifth.—A Course of Tool instruction, including joinery, pattern-making, wood-turning, wood-carving, modelling, forging, soldering, brazing, moulding and casting, vise-work, and mechanical construction.

CHICAGO MANUAL TRAINING SCHOOL.

Drawings.—The drawings of the Junior (first year) Class are:—

1. From models of Geometric Solids and other objects, single and in groups.

2. Sketches with Pencil and in Ink made at home from Miscellaneous Objects. (40 in the school year.)

3. Charcoal work from casts.

The above wholly free-hand.

4. Elementary work in Mechanical Drawing.

5. Perspective.

6. Problems in Plane Geometry.

7. Orthographic Projection.

8. Elementary design.

9. Studies from Ornaments.

The drawings of the Middle (second year) Class consist of

1. Orthographic Projection.

2. Details of machinery from measurement.

3. Home Sketches in Pencil and in Ink. (30 in the school year.)

The drawings of the Senior (third year) Class comprise:—

1. Machine drawings from measurement.

2. Architectural drawings from measurement.

3. Home Sketches. (10 in the school year.)

Except Historic Architecture and Ornament and the original work, the drawings are wholly from the object.

N.B.—The drawings exhibited are of *average* excellence. The *best* drawings are not sent to any exhibit.

The total number of drawings made in the school year 1889–90 was 13,630. The number this year is estimated at 16,000. Pupils: last year, 277; this year, 303.

Shop-work.—The exhibited work of the Junior Class comprises:—

1. Exercises in planing, sawing, and in making "joints," T square and triangles.

2. Exercise in turning: tool-handles, rosettes, gavel, vases, dumb-bell, ball, ring.

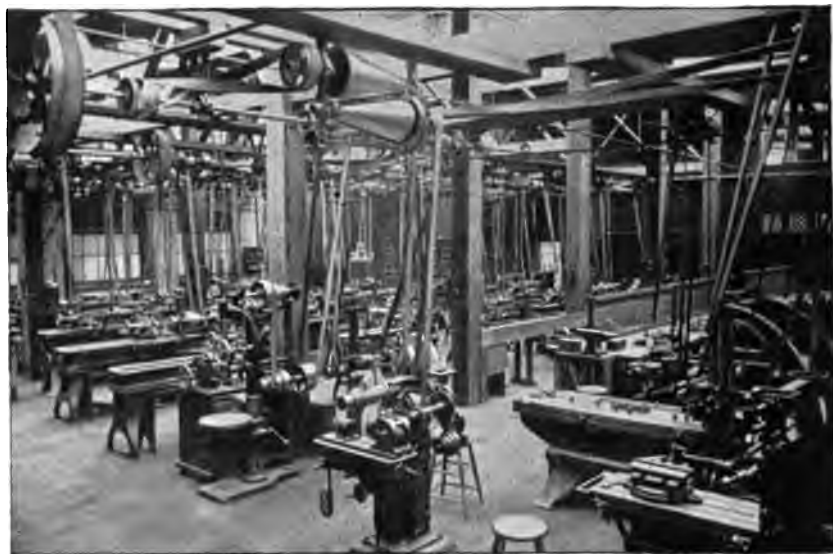
3. Patterns: hangers, pulleys, stove-grates, hand-wheel, gear-wheel, wrenches, $\frac{1}{4}$ turn pipe, $\frac{1}{2}$ turn pipe, journals, core-boxes.

The exhibited work of the Middle Class comprises:—

1. Foundry work.

2. Exercises in forging: lathe tools, blacksmiths' tools, axe, etc.

The Senior Class work exhibited includes:—



MACHINE SHOP. MASSACHUSETTS INSTITUTE OF TECHNOLOGY.



FORGE SHOP. MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

1. Exercises in lathe-work: straight and taper turning, screw-cutting, boring, and reaming.
2. Exercises in chipping, filing, planing, scraping, drilling, tapping, and finishing.
3. Exercises on planer and shaper.
4. Tools: boring-bar and cutters, chucks, milling-tools, dies, taps, lathe-centres, counter-sinks, reamers, arbors, calipers, try-square, hammer.
5. Parts of two compound marine engines, fitted with Marshall's valve-gear.

The drawings of these engines were furnished by the Bureau of Steam Engineering, United States Navy Department. The blue prints exhibited were made by the class.

Larger work, such as tables, bookcases, drawing-stands, steam-engines, etc., are not included in this exhibit.

The academic course of the Chicago Manual Training School is essentially that of a three years' English High School, with Latin or French elective instead of English Literature, etc. The course is

1. *Mathematics*: Algebra, Plane and Solid Geometry, Plane Trigonometry, Book-keeping.
2. *Science*: Physiology, Physics, Chemistry, Physical Geography. (Physics and Chemistry each one year, with laboratory practice.)
3. English Literature, General History, Civil Government, Political Economy; or Latin; or French.
4. Drawing, 5 hours a week.
5. Shop-work, 10 hours a week.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

EXHIBIT OF SHOP-WORK.

The Shops of the Massachusetts Institute of Technology, opened in 1876, were transferred in 1884 to their present location at the foot of Garrison Street, opposite the Charitable Mechanics' Association Building, and adjoining the Providence Railroad.

In the shop building are the following departments: a Carpenter Shop, a Pattern and Wood Turning Shop, a Machine Shop, a Forge Shop, and a Foundry, together with the engine and a boiler. In the Carpenter Shop there are forty benches with drawers, lockers, and tools, and such special machines as circular and jig saws, a planer, etc. In the Pattern and Wood Turning Shop there are thirty-six pattern makers' benches, with wood-turning lathes and the requisite tools. In the Machine Shop there are twenty-three engine lathes, seventeen speed lathes, two planers, a shaper, a drill press, a milling machine, and a universal grinding machine, together with the proper equipment of supplemental tools. In the same room are arranged thirty-two benches for chipping and filing, scraping, and other bench-work. In the Forge Shop there are thirty-two forges and anvils, with proper tools. In the Foundry are a cupola furnace, two brass furnaces, a white metal furnace, a core-baking oven, and thirty-two moulders' benches.

The regular classes in Mechanical Engineering have two hundred exercises, of two hours each, in shop-work, distributed as follows: in the second year, thirty exercises in Carpentry and Wood-turning and fifteen in Pattern-making; in the third year, fifty-five exercises in Forging and twenty in Chipping and Filing; in the fourth year, fifteen exercises in Chipping and Filing and sixty-five in Machine Tool-work. Eight exercises in Foundry Work are given as an extra to such students as desire and have time for it.

The classes in Electrical Engineering have an abbreviated course, forty-five exercises in all, in Carpentry, Wood-turning, and Metal-turning.

Classes in Chemical Engineering have sixty exercises in Carpentry, Wood-turning, Forging, and Metal-turning. Students in some other courses take shop-work, either as an extra or as an option.

Our method of instruction, which has been known as the Russian system, has been adopted because it is believed to give the most thorough instruction and in the most expeditious manner. The pieces made are considered as problems teaching various operations and the use of the several proper tools. All work done is for the sake of instruction, the amount of material used or the thing made being of secondary or no importance. Good work is expected and obtained from the beginning; and for this purpose the student is taught, by precept, example, and his own experience, how every operation is to be done before he undertakes it. The latter work of a course is the making of some structure, tool, or machine. Thus in the Carpenter Shop each student individually makes a truss, a bracket, and a column; in the Machine Shop, several students working together make a chuck, a pump, or a lathe, and so learn the assembling of work, and have an added interest given to their instruction.

WASHINGTON PUBLIC SCHOOLS.

The exhibit from the public schools of Washington, D.C., represented form study as developed through clay moulding and carving; stick-laying; paper folding and cutting; construction of models in card-board, and examples of design applied to needlework; drawing and tool laboratory work in shops. The constructed forms and drawings were arranged in the order of their development through the twelve years of the school course, including High School and the Normal Training School. Both the constructions and the drawings were selected from the regular school work of the pupils, which represented the courses of work actually in operation as far as they could be represented by an exhibit.

OUTLINE OF EXHIBIT.

First Year.—Geometric solids, together with a variety of objects suggested by these forms, were shown in clay. No drawing was shown in this connection. (The use of the pencil at the beginning of the first year is confined to drills for securing correct position and correct movements for drawing straight and curved lines.) The study of the edges of the solids made in the grade was shown by constructions with sticks of different lengths, defining both the geometric forms and invented combinations of them. These were represented by drawings. The planes, squares, oblong rectangles, and triangles, with invented combinations of the same made in folded colored paper, were shown, drawings of the same being given.

Second Year.—Forms in the same materials were shown as those of the first grade, and in the same order, those in clay being of increased size and of greater variety. In stick-laying, the rhomb was contrasted with the square, and the rhomboid with the oblong rectangle, etc. The sticks were used also to develop ideas of length and of the division of lines. This work was represented by drawings. The paper-folding of this year involved all the geometric forms having right lines, including original combinations, primary colors and their tints being used. Drawings of these forms were given.

Third Year.—The forms in clay were larger than those of the first and second grades. The paper-work was shown in cutting, consisting of units of design and their arrangement in squares, oblongs, rhombs, triangles,

and in borders. This year was represented in drawing by drill exercises in straight lines and circles, top and front views of solids, representations of envelopes, fans, bottles; representations of the designs in colored paper.

Fourth Year.—The sphere, the ellipsoid, and the ovoid were the geometric forms represented in clay. Based upon these forms were many fruit forms, and forms of pottery of specified height, showing increased power in the use of clay. Paper-cutting was shown, consisting of units of design and their arrangements in the pentagon, the hexagon, the octagon, and in borders. The pencil drill of this year was shown in the circle, the ellipse, and the oval. The drawings were of forms above named, as well as of fruits and vegetables drawn from nature.

Fifth Year.—Working drawings and developments for geometric forms with the forms in card-board made from the working drawings were shown. Drawings of objects, the cylinder and the cone, and mugs, tumblers, and other objects based on those geometric forms, were exhibited, giving their appearance as seen below the level of the eye. Leaf-drawing from nature was an important feature of the work in this year's exhibit, a great variety of leaves being shown. In decorative work these leaves were conventionalized and arranged in rosettes and borders. These were applied to outline embroidery. A few were cut in paper. In clay, ivy and other leaves were shown. Conventional arrangements of leaves and some historic forms, principally the lotus, carved in clay, were also shown.

Sixth Year.—Advanced working drawings and their developments, with the models made from them in card-board, were shown. The drawings represented rectangular solids, in addition to drawings similar to those of the fifth grade. These were drawn from the constructed forms, single and in groups. Vases, books, and other objects were represented in groups. Drawings from nature of leaves and branches, and decorative arrangements designed from these were shown. Mouldings in clay of leaves and branches were shown, with some examples of historic ornament, moulded and carved.

Seventh Year.—Working drawings of this year made by use of instruments involving geometric problems were shown. Object-drawings were of groups of geometric solids and various other objects based on them. The drawings from nature were leaves, branches, and flowers. Decorative work consisted of bilateral arrangements of the foregoing. Applications of color to articles of use were shown in this year's exhibit.

Eighth Year.—Additional geometric problems and their applications to construction were shown, also drawings of objects in the school-room to scale, and complete working drawings of many small objects. Pocket-books made of leather and numerous other useful articles were exhibited. The object-drawing consisted of groups of books, vases, and other forms. Drawings from nature were flowers from which the decorative arrangements were made. Many of these were applied to the embroidery of various articles. Mouldings in clay were groups of fruit, nuts, flowers, and of historic ornament. Mouldings of some of the bones used in the study of physiology were shown.

HIGH SCHOOL.

The High School exhibit represented a three years' course.

First Year.—The leading problems in plane geometry, work in projection, and perspective. Object-drawings in outline and in light and shade (charcoal). Flower-drawings and decorative arrangements.

Second Year.—Projection of various solids. Problems in perspective. Object-drawings from the round and from casts of ornament in full light and shade (charcoal and crayon). From nature, flowers, and plants. Applied designs made from these natural forms.

Third Year.—Projection of shadows finished in water color. Perspective problems. Drawings from casts of ornament and of the human face

and its parts (crayon). Water-color drawings, flowers from nature, enlarged copies of historic ornament, original designs from the flower forms. Clay moulding from natural leaves and flowers and original designs for relief ornament. From the business department of the High School sheets of mechanical drawing were shown.

Normal Training School.—This exhibit consisted of an outline of the entire course in drawing from the first to the eighth year as executed by the normal pupils, also of large charcoal drawings made by the pupils for use in the development of the various subjects taught by them in the practice schools, as language, number, history, geography.

TOOL LABORATORY WORK.

First Year: Grade VII.

Bench-work.—Twelve exercises illustrating the principles of:—

Dressing: from the rough with saws and planes.

Laying out: measuring, gauging, and scribing.

Cutting (outside): flat and convex surfaces with chisel; concave surfaces with gouge; boring.

Joining: plain and oblique lap joints; halved dovetail joints; slip tenon joints; glue and dowel joints.

Cutting (inside) and Joining: mortise and tenon joints; keyed joints.

Framing: mortise and tenon joints.

Special pieces involving the application of the exercise work above enumerated, together with jig-sawing and inlaying; foot-stools, shelves, etc., involving finishing with sandpaper, stain, and varnish. All exercises and special pieces were made from blue prints. Prints shown.

Second Year: Grade VIII.

Bench-work.—Three exercises reviewing broadly, on more difficult pieces, the principles taught the first year. Dovetail boxes in pine, walnut, and oak, with hinged lids having locks. Special pieces; shoe-boxes and shelves. All exercises and special pieces were made from blue prints. Prints shown.

Third Year: High School, First Year.

Drafting.—Five exercises illustrating the principles of:—

Lettering: plain and ornamental.

Working Drawings: drawings, tracing, and blue prints for work done in seventh and eighth grades; drawings, tracings, and blue prints for wood-turning, the drafting being done from free-hand sketches or from specifications.

Wood-turning.—Eleven exercises illustrating the principles of:—

Plain turning: cutting cylinders, tapers, brads, and irregular curves. Boring.

Face plate and chuck work.

Pattern-turning: cone pulley. Special pieces; mallet, vase, telephone-receiver, and Indian clubs. All exercises and special pieces were made from blue prints. Prints shown.

Fourth Year: High School, Second Year.

Forging.—Seventeen exercises illustrating in iron and steel:—

Drawing: round rod with square point; hook staples.

Bending: ring; figure eight; bent eye.

Upsetting: bent angles, flat and edge bends; upset oval.

Fullering and swaging: upset octagonal; forged fork.

Welding and punching: tongs.

Steel tool-making, involving hardening and tempering: cold chisel; diamond points; side tools; boring and thread tools. All exercises were made from blue prints. Prints shown.

Fifth Year: High School, Third Year.

Hand and Machine Work in Metal.—Seven exercises illustrating the principles of:—

Chipping and filing: plane surfaces and bevels; cutting key-ways.

Hand-tooling, filing, and polishing in speed lathe.

Engine Lathe.—Plain turning: cylinder; taper pieces.

Screw-cutting: right and left V threads; nut arbor with square threads.

Chuck drilling and boring: hexagonal nut; coupling flange; cone pulley.

Shaper work: plane surfaces; cutting key-ways.

THE BOSTON PRIMARY SCHOOL EXHIBIT.

The urgent need of systematic study of *form* and *color* has long been recognized in our primary schools, and the subject has received much thoughtful consideration by our educators. A few teachers have voluntarily experimented in their own classes during the past few years, with happy results in most instances; and some of the more enthusiastic formed classes for private instruction. But a lack of the necessary materials required in the study and uncertainty as to the best practical methods to be adopted prevented the school authorities from ordering the general introduction of manual training into our primaries until a very recent date. In January last the committee arranged to give the teachers a systematic course of instruction in the forms of manual training, adapted to our revised "Course of Study." Before the course of twelve lessons had been completed, the primary teachers were invited to contribute to "the exhibit." In cheerful compliance they sent in the best specimens of class-work their limited experience enabled them to produce. Under the circumstances, it was manifestly impossible to properly present their exhibit by schools, and it was necessarily classed by grades instead. The exhibit showed that the course of study was not unlike that of the kindergarten, in form study and drawing, but expanded and amplified, and that there was a system running through all the grades of primary work, and that each step was a logical outcome of the preceding one, and led to the one that was to follow. The clay-work gave evidence of careful study of the type-solids, and drawing was a prominent feature. The designs were novel and interesting. In short, the exhibit demonstrated that the plan of the work was based upon a study of the facts of the type-solids, followed by clay-modelling, tablet work, paper-folding, stick-laying, and DRAWING *from* OBJECTS, thereby illustrating the natural growth of the hand and eye training begun in the kindergarten into a broader development of the study in our primaries,—thus giving our scholars during their earliest school life a fundamental knowledge of manual training principles, so essential in meeting the requirements of the advanced grades.

SEWING EXHIBITS.

SEWING IN THE BOSTON SCHOOLS.

Instruction in sewing is no new thing in the schools of Boston. In 1820 one teacher of a primary school reported that among the articles of work done by the twenty-six girls of the school during the preceding quarter there

were made "30 shirts, 12 pairs of sheets, 6 pairs of pillow-cases, 26 pocket-handkerchiefs, 8 cravats, 10 infants' frocks, 5 coarse bags, 4 dozen towels, 4 pairs of socks, 3 pairs of mittens, and a number of smaller pieces of work." In 1835, upon the petition of a committee of ladies of the Seamen's Aid Society, praying that needlework might be taught to the girls in the *grammar schools*, the School Board adopted the following resolution:—

Resolved, That the girls of the second and third classes, who attend the public writing schools of this city, may be instructed by the female instructors of said schools in plain sewing, one hour in the afternoon of every school day, beginning forthwith and ending the first Monday in November of the present year, and in future years beginning the first Monday in April and ending, as aforesaid, the first Monday in November.

In 1854, sewing having been for some time neglected, renewed interest in the subject was manifested; and a petition, signed by thirty-nine hundred and forty-seven women of Boston, requesting that sewing might be introduced into all the grammar schools for girls, was presented. The special committee to whom the subject was referred reported that they believed the usefulness of the schools would be enhanced by the proposed change, and that no girl could be considered properly educated who could not sew. Upon the recommendation of this committee it was ordered that instruction in sewing should be given to all the girls in the fourth class in all the grammar schools. The grammar schools at this time were divided into four classes only; and the fourth class, which was the lowest, contained about one-third of all the pupils in these schools. In 1868 the number of classes was increased to six, and in 1870 instruction in sewing was provided for all the girls in the fourth, fifth, and sixth classes. In 1875 a question arose as to the legal right of the School Board to employ special teachers of sewing, the City Solicitor giving it as his opinion that the School Board could not legally employ such teachers. In 1876, upon the petition of the School Board, the legislature passed an act authorizing the teaching of sewing "in any city or town, in all the public schools in which the School Committee of such city or town deem it expedient."

Since then the teaching of this art has gone on without interruption, and each year its capabilities are more largely developed. The instruction, which is thorough and systematic, is given for two hours each week to all girls in the fourth, fifth, and sixth classes; and in mixed schools, where no other manual training is provided, the boys also are allowed to sew. In some of the large schools exclusively for girls, sewing is continued in the upper classes for one hour each week, the drafting of dress-waists and cutting of dresses and other garments by patterns being taught.

Thirty special teachers are now employed, and as far as possible the instruction is uniform and progressive, a regular course being undertaken with each pupil. As fast as the different stitches are learned, they are applied to the making of garments and useful articles of clothing. To teach children to know the things they need to know and to do the things they will need to do every day of their lives is good instruction; and the practical value of it is most obvious in a large city like Boston, where thousands of completed garments are each year returned to the homes, to add to the comfort of the children and their parents.

While manual and industrial training in the public schools is in such an experimental state, the art of sewing holds a firm and well-established place in the grammar schools. Its neatness and simplicity, the slight inconvenience and interference with the regular order and discipline of the classes, and, above all, the small expense necessary, render it less liable to objection than any form of manual training to be introduced into the school-room, while as a training for the eye and hand it is equal to drawing.

Fully appreciated and carefully fostered by the masters and teachers, this industrial work is assuming its true place as a valuable educational influ-

ence; and, as a general preparation for the duties of life, no branch of the school course is more satisfying than this.

The library was assigned to the Boston sewing exhibit. It embraced all grades of work done in the grammar schools, and contained contributions from all parts of the city.

SEWING IN THE SOMERVILLE SCHOOLS.

The exhibition of the work of the public schools of Somerville, Mass., was placed in the principal's office, adjoining the school library. It embraced charts of mounted work, showing the successive steps of each grade from the fourth year in school to the ninth. The tables were covered with garments made by the pupils, in which the instruction had been practically applied. These were mostly common house-work, such as bed-clothing, dining-linen, underclothing, and children's garments. These articles were made at home at the suggestion of the teachers, and practically under their direction.

The sewing teachers are Mrs. C. M. Coffin and Miss Mary L. Boyd.

The following is the course of instruction:—

Grade IV.—First Year of Sewing.

Folding.

Basting.

Backstitching.

Overcasting.

Hemming.

Overhanding.

Proper wearing and use of thimble in connection with needle.

Right length of thread, threading needle, and making knots.

Holding of work by left hand.

Position of work and needle taught in connection with stitch given; also beginning, joining, and fastening of thread.

Stitches should first be drawn upon paper, using the ruler to insure accuracy in length of stitch.

Hems, wide and narrow, may first be turned upon paper, using the ruler for a measure.

Each new stitch should be preceded by a drill in the proper position of the hands and fingers while making the stitch; also a drill for the arms in the motion of drawing the thread and needle through the cloth.

Models: articles brought from home may be towels, napkins, and handkerchiefs to hem.

Grade V.—Second Year.

Review of previous year's work.

Overhanding on folded edges.

Overhanding on selvages.

Wide hems.

Plain fell.

Running. Especial drill given in the position of the fingers in making this stitch; also teaching the pupils to use the side of the thimble.

Darning tear.

Simple drafting.

Models: a pillow-slip, plain apron without gathers, or small sheet, bibs.

Grade VI.—Third Year.

Review previous year's work.

Gathering, laying or stroking gathers, putting gathers into band by backstitching and hemming.

French fell, straight fell, reversible seam.

Darning tear with silk.

Patching on cotton cloth.

Button-holes, four-holed buttons sewed on.

Feather and herring-bone stitches.

The proper way of tearing or cutting cloth for bands or ruffling; namely, straight or across the grain.

Drafting simple under-garments from measurements.

Models: apron with band, plain white cotton or flannel skirt with band, button-hole, and button sewed on.

Grade VII.—Fourth Year.

Review previous work.

Review button-holes and sewing on buttons.

Patching on calico and woollen goods.

Stocking-darning.

Darning tear with ravellings.

Putting in gussets.

Cutting bias bands and joining same.

Tucking and ruffling.

Hemstitching.

Blind-stitching.

Gathering, as done on dress skirts.

Gathers overhanded to band.

Drafting child's dress.

Models: some garment to be made combining the stitches learned, and teaching the cutting and putting together.

Suggestions: In all grades particular attention should be given to the position of the pupils while sewing. Accuracy of rule and measure is to be insisted upon.

Soft, half-bleached cotton cloth and colored thread may be used for practice work, the colored thread showing the shape and size of the stitches better than white.

Materials for practice work for one pupil for the first year are as follows: one-half yard of half-bleached cotton cloth; one spool of red cotton, No. 50; one spool of blue cotton, No. 50; one spool of yellow cotton, No. 40; one thimble, pinball filled with pins, and sewing-bag made from one-half yard of calico, with owner's name sewed upon it.

Sewing was introduced into the Somerville schools three years ago. The eighth and ninth grades have not yet advanced beyond the seventh.

SEWING IN THE SPRINGFIELD SCHOOLS.

Sewing was made part of the regular work, obligatory upon girls in the lowest grammar grade of the public schools, in April of 1884.

The following year the work was taken up in two more grades, and subsequently advanced to the seventh, the grades now at work covering the fourth, fifth, sixth, and seventh school years.

In the beginning the pupils were taught to make such articles as they chose or were permitted to bring to work upon.

This plan not proving wholly satisfactory, the present method was adopted five years ago.

The aim is to give the pupils in a four years' course, with one hour's instruction per week, such a knowledge of the stitches used and principles governing plain sewing that they will be able to do the ordinary work in the home of making and repairing garments.

The plan of work is to teach each year a series of stitches, then to make an article using these stitches, thus showing to the pupils the application and value of each stitch and principle learned.

The seventh-grade pupils are taught the measuring, drafting, cutting, and making of children's underclothing, the work being done with a doll in order to cover more ground in a limited time, the principles taught being the end in view rather than the completed garment. In teaching, great care is taken with position of body and hands, the proper holding of work and needle, the drawing of thread, use of thimble, scissors, and measure. The influence of the general tendency to misapprehend the educational value of manual work has at times been felt in the work. This has been counteracted by examinations, the pupils waking up to the fact that successful manual work must be the result of combined brain and muscle power.

The increasing ease with which pupils take up new work in this line shows its educational value, in added thought, power, observation, accuracy of eye, and skilled fingers.

For the last three years the young ladies of the Normal Training class have taken the course, the work with this class being to illustrate principles and how to present them to children.

FORM AND DRAWING EXHIBITS.

SOMERVILLE, MASS.

The present system of work in form and drawing was begun in December, 1888. At first no grading was attempted in the three primary classes. All the children were given the first solids, the sphere, the cube, and the cylinder. These were modelled in clay. Tablets, representing faces of the solids, and sticks, representing the edges, were also used. Naturally, the third-year children were able to accomplish more than the younger ones; and in September, 1889, separate work was laid out for each of the primary grades.

The work of the grammar schools had, at first, but two divisions: the three lower classes in the first, and the upper classes in the second; the work of each three grades being substantially the same. At first much attention was necessarily given to free movement, no erasing being allowed. This rule has been adhered to, except in the upper grammar grades. At the end of the first six months the ninth, or highest, grammar class was able to draw the cylinder and objects based upon it, also to draw leaves and sprays. No rectilinear objects had been attempted.

This exhibit is by no means complete: it merely marks the progress of two years' work. Free-hand parallel perspective has been taught in the seventh class. Objects showing angular perspective are studied in the ninth class. As the work advances, what is done in the higher classes will bear its proper relation to that of the lower grades.

The work from paper, above that of the first year, has been entirely free-hand drawings, and represents drawing, as well as cutting and pasting. As yet no systematic color-teaching has been attempted: strong contrasts have been avoided, and simple, harmonious coloring commended.

The mechanical drawing shows the work of six months done by the boys of the grammar classes while the girls had their sewing lessons. This department was introduced in October, 1890. All had to learn to rule and measure, and the first work of all the classes was very elementary. The

older boys are now able to make patterns of simple objects, to construct the objects, and to make drawings of them.

In all the work the endeavor has been to make each part of the course harmonize with what has preceded and also with what is to follow. Not until the children now in the primary schools reach the highest grammar class can the value of the preliminary training be rightly estimated. The exhibit shows the work done in several grades during the last term, and is as follows:—

Kindergarten.—Folding, sewing, weaving.

First Grade.—Sewing and clay-modelling, illustrating the lessons in natural science. Cutting, folding, and free drawing, based upon the study of the sphere and cube.

Second Grade.—Cutting from free drawing, and drawings based upon the cylinder, square prism, hemisphere, and triangular prism.

Third Grade.—Cutting and drawing based upon ellipsoid, ovoid, equilateral triangular prism, cone, and square pyramid.

Fourth and subsequent grades indicate more definitely the three leading lines of drawing, namely: first, constructive; second, pictorial; and, third, decorative, as follows: drawing of facts of type-forms already studied; drawing of natural objects based upon sphere and ellipsoid; arrangements of type-forms in paper; borders and surface covering.

Fifth Grade.—Drawings of facts of type-forms and objects based on type-forms. Pictorial drawings of natural forms and simple familiar objects. Arrangements in paper of units around a centre and borders.

Sixth Grade.—Drawings of the facts of simple objects and patterns. Perspective of the cylinder and objects based upon the cylinder. In paper, arrangement of units to show by bilateral symmetry surface covering and drawing of simple forms of historic ornament.

Seventh Grade.—Top, front, and end views of solids. Simple groups of objects, involving free-hand parallel perspective. In paper-work, borders, all-over patterns, and simple forms of historic ornament.

Eighth Grade.—Drawings to show construction of more difficult objects. Groups of objects showing parallel perspective. In paper-work, repetition of units to cover vertical surface.

Ninth Grade.—Work in constructive drawing. Objects in angular perspective drawn. In paper-work, simple designs from conventionalized plant-forms.

High School.—Outline drawings of casts, groups of models and objects.

The evening school exhibit embraces free-hand work of a three years' course in outline and light and shade, all drawings from models and casts; and the work in mechanical drawing of a three years' course, geometric, machine, and architectural.

There was a miscellaneous exhibit from the grammar schools of work in geography, embracing map-drawing and map-making of all materials,—paper, cloth, putty, clay, etc.,—and work in arithmetic, both drawing and construction.

SOMERVILLE COURSE IN MECHANICAL DRAWING AND CONSTRUCTION.

FOURTH YEAR.

I. Drawing.

Tools: rule and pencil.

1. Draw horizontal, vertical, and oblique parallel lines.
2. Locating lines at given distances (arrangement).
3. Dividing lines into inches, $\frac{1}{2}$ in., $\frac{1}{4}$ in., $\frac{3}{8}$ in.; bisecting, etc.
4. Measuring books, slates, desks, etc. Laying off lines of exact measurements.

5. Draw squares and oblongs by aid of cards with square corners, angles, crosses.
6. Practical applications of above at teacher's discretion.
7. Application of above to work in arithmetic.

II. Construction.

Material: sticks, tablets, and paper (manila and colored).

1. Folding squares; diameters and diagonals, areas, circles, diameter, and radius.
2. Cutting quadrilaterals and triangles, crosses; developments, patterns of cube, to correspond with the free-hand drawing.
3. Clay modelling: tiles, fruit, and leaves.

FIFTH YEAR.

I. Drawing.

Tools: pencil, rule, angle 45 degrees, compass and pencil.

1. Review work of fourth year. Teach 1-16 inch.
2. Draw quadrilaterals (all the parallelograms) and triangles (by taking half the quadrilaterals).
3. Draw patterns of cube, square, and triangular prisms, rectangular box. All drawings to measurement.
4. Draw circles: diameters, semicircle, and quadrant.
5. Draw fractions of a circle: $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, $\frac{3}{8}$, $\frac{5}{8}$.

II. Construction.

Material: manila paper, card-board, paste.

Tools: scissors, knife, cutting-board.

1. Continue and review work of fourth year.
2. Make tablets of card-board as above; fractions of circles, maps of paper and card-board. Cut out all forms drawn, to test accuracy.
3. Make patterns as above, and paste.
4. Clay modelling as in fourth grade; make clay maps.

SIXTH YEAR.

I. Drawing.

Tools: pencil, rules, angle 45 degrees, pencil and compass.

1. Review previous work. Begin drawing to scale, half size and quarter size.
2. Draw all quadrilaterals. All triangles.
3. Draw patterns as before, adding equilateral triangular prism.
4. Divide circles into thirds and sixths. Draw hexagon.
5. Ellipse (string and pins), vase forms, shields, etc.
6. Block letters.
7. Simple problems in plain figures.

II. Construction.

Material: clay, manila paper, card-board, soft wood, paste, glue.

Tools: scissors, knives.

1. Construct figures drawn.
2. Invention.

3. Make letters.
4. Make fractions.
5. Make maps.
6. Clay: tiles, bas-reliefs, maps, invention of designs in clay.

SEVENTH YEAR.

I. Drawing.

Tools: pencils, rules, angles, pencil and compasses, T square, and drawing-board.

1. Review work of previous grades. Draw to scale, 1 inch equals 1 foot.
2. All quadrilaterals and triangles to scale and upon given lines; erect perpendiculars.
3. Inscribe triangles, squares, and hexagons in circles.
4. Draw ellipse and oval.
5. Draw surface patterns as in drawing-book and working drawings.
6. Lettering. Designs for ornaments.
7. Continue geometric problems involving the circle, inscribing and circumscribing.

II. Construction.

Material: clay, card-board, soft wood, paste, glue.

Tools: knives, try-square.

1. Construct all forms drawn of paper, card-board, or wood.
2. Continue work of previous grades.
3. Test the accuracy of all forms by cutting out, dissecting, and applying.

EIGHTH YEAR.

I. Drawing.

Tools: same as for seventh grade.

1. Review work of previous grades. Draw to scale, $\frac{1}{2}$ inch and $\frac{1}{4}$ inch equals 1 foot.
2. Draw all polygons. Circumscribe and inscribe.
3. Draw stars corresponding to polygons drawn.
4. Draw surface patterns of solids, base corresponding to polygons drawn.
5. Draw working drawings of same, including simple sections.
6. Lettering. Designs for ornamental work.
7. Geometric problems suggested by the intersection of lines, angles about a point, angles of triangles.
8. Working drawings of sloyd course.

II. Construction.

Material: clay, card-board, wood, paste, glue.

Tools: of the sloyd course.

1. Construct forms drawn. Test accuracy of all problems by cutting out and comparing.
2. Continue work of previous grade.
3. Make solids (plinths, pyramids, prisms).
4. Industrial designs in colored paper.
5. First sloyd course.

NINTH YEAR

Continuation of eighth-grade work.

Simple geometric problems, including tangents and the construction, areas, and comparisons of quadrilaterals and triangles.

Draw to scale, $\frac{3}{4}$ inch equals 1 foot. Make simple oblique sections.

Draw and construct patterns for solids of given dimensions in connection with problems in arithmetic.

Drawing and construction in clay of forms of historic ornament and architecture.

Industrial designs in colored paper.

Working drawings and tool instruction of second sloyd course.

THE GEORGE PUTNAM SCHOOL.

The exhibit of the George Putnam Grammar School, Boston, consisted of work in design, model and object, and plan-drawing.

The plan for teaching design now employed in the school has been in operation five years. The aim has been to make work in design possible for every pupil, and to take the laboring oar out of the hands of the teacher.

The work is begun in the lowest grammar grade by folding a piece of manila paper, four inches square, on a central line parallel to the two opposite sides; then folding on a central line at right angles to the first fold, thus marking off the paper into four small and equal squares; then folding on the diagonal of the small squares, thus marking off the paper into eight equal parts, all converging to a common centre. In one of the divisions the pupils are told to draw with a soft pencil a straight line and a curved line in connection, the teacher illustrating on the board. This forms the element of the design. The straight line and curved line in connection are capable of an infinite variety in length and direction. What has been drawn in one division is folded down on the next division and transferred to it by rubbing on the other side of the paper with a glass ink-well cover, bottle, end of pencil, knife-handle, or other suitable instrument.

Thus one-fourth of the perimeter of a design is formed; by folding and transferring, as before, a half; and then the whole perimeter may be formed. The centre is made in a similar manner. Provided the folding and transferring have been accurately done, the design is of necessity perfectly symmetrical.

The centre is generally formed first, and the design is carried out far enough to cover the paper well.

The teacher aims to secure simplicity, breadth, strength, especially at the centre, and symmetry in a simple way. The best specimens are pinned up for examination.

The pupils discover that they can make pleasing and symmetrical forms in infinite variety and number.

The fifth-grade pupils follow the same plan, giving greater breadth and unity to their work. They half-tint parts of their designs free-hand, and work quite independently of their teacher, when required.

The sixth-grade pupils employ the same process, but different elements, such as natural leaves pressed, which they collect and keep in paper boxes. Half-tinting is continued, and colored crayons and water-colors are used to some extent. Much work in making borders is done by employing the principles of repetition and alternation.

The seventh-year pupils make bilateral designs from plant-forms and cover surfaces, such as diamonds and oblongs, by means of tracing paper. Free-hand half-tinting is continued.

The eighth-year pupils use the same process and elements which they used in the seventh grade, but add colored ink in making outlines and backgrounds.

The pupils of the ninth grade (sixth year in the grammar school) use all the processes and elements employed in the grades below with much skill. They press plant-forms, mount them on the upper left-hand corner of a sheet of drawing paper, make a free-hand drawing of the same on the right, and then conventionalize the form and adapt it to some geometric form which the plant-form naturally suggests, the woodbine and ivy leaves suggesting the pentagon, the clover leaf the triangle, etc. The plant-forms found in seed and flower catalogues, and sent out by seedmen, serve for material in design work. Colored inks in greater variety and harmony are used, the half-tinted backgrounds having the appearance of delicate water-colors. Historic ornament in design and the leading lines of meritorious forms in wall papers and borders are studied and utilized.

All these points were illustrated by the work shown on fifteen sheets of drawings.

In object-drawing considerable freedom of choice of objects is allowed pupils. Playthings illustrating ellipses, circles, cylinders, square and rectangular faces, etc., are found serviceable in calling out and sustaining interest. Copying flat copies is discouraged.

Fourth and fifth grade pupils draw from the objects named above. Each pupil having in hand an interesting object illustrating the ellipse is ready to apply intelligently the instruction on the ellipse given by the teacher. He is obliged to exercise his own judgment continually, whether he succeeds or fails in making a good drawing. So he develops power.

Sixth and seventh grade pupils add simple plant-forms and shells.

Eighth and ninth grade pupils add more difficult shells, and plant-forms, buds, and plantlets in successive stages of development, grasses, vegetables, and sprays of leaves and flowers.

In the ninth grade most of the work is done with pen and ink, and water-colors in plain washes are used to some extent.

Choice of objects, great interest, and constant practice in grasping and representing forms, irregular as well as regular, develop unusual power in drawing throughout the classes. The amount of work done is astonishing to those familiar only with the common regulation methods.

The study proceeds from familiar objects to the less familiar type-solids in the three upper grades. In case of a multitude of objects drawn, a familiarity with type-solids appears to be of no use whatever. Familiarity with and close observation of the thing itself have no substitutes.

The work in object-drawing on exhibition illustrated all the points named above. There were fifteen sheets of drawings, each sheet containing from four to twelve drawings.

The work in plan-drawing covered fifteen sheets, and illustrated the work throughout the school in drawing plans to a variety of scales in connection with problems in arithmetic.

The pupils of the fourth grade draw simple rectangular figures, such as the outlines of books, slates, desks, windows, panes of glass, doors, etc., using two scales only, one inch and one-half inch. The work may be more properly designated by "graphic methods in arithmetic" than by "constructive drawing."

The fifth-year pupils draw similar figures, adding the quarter-inch scale, and applying it to some imaginary figures, quarter-inch to a foot, yard, rod, etc.

The sixth-year pupils add the eighth-inch scale, and the problems illustrated include a third dimension.

The next grade continues the same work, with more difficult problems.

The eighth and ninth grades draw to any scale any of the common figures used in mensuration, using a third dimension in problems concerning chimneys, boxes, rooms, lumber, etc.

If pupils cannot conveniently attend a manual training school, they can always use a pencil and ruler in drawing plans to scale, which serve to clear up many arithmetical problems. These plans, as far as they go, serve the same purpose as figures in geometry and ground plans in various kinds of buildings.

The problems and plans sent from the four highest grades were made up by the pupils in those grades, this being a custom.

The exhibit of sloyd work was made by boys in different classes, primary as well as grammar. This work is elective, those boys especially who need an added interest or study being encouraged to take it up. It is valuable as a disciplinary measure in the general management of a school. Used as it has been in the school, the work has been successful in every respect.

PORTSMOUTH, N.H.

This department is as yet very elementary. Work was begun in September, 1889.

The exhibit shows the work done in the first four grades by pupils from five years of age to ten or eleven years since September, 1890.

The models used in these grades are geometrical forms, supplemented by numerous objects whose forms bear close relationship to geometrical types.

First Year.—Solids: sphere, cube, cylinder, and square prism. Tablets. Points: positions, etc. Develop ideas of distance, one inch, two inches. Lines: kinds, positions, relations, teach bisect and quadrisect. Colors: primary and secondary. White's Industrial Drawing Book, Revised, No. 1.

Second Year.—Models and objects studied. Solids. Tablets. Objects. Design: arrange tablets and sticks. Draw arrangements. Colors: primary and secondary, also tints. As in the previous year, modelling, studying the surfaces, arranging tablets of form similar to the surface of the solids, folding and cutting the shape of the tablets, and drawing the edges of the forms and objects studied. White's Revised Book, No. 2.

Third Year.—Solids. Tablets. Objects.

After reviewing the work of the first two years thoroughly in paper and blackboard, drill carefully upon angles and their applications. Use the *plain* geometric figures for the making of decorative arrangement illustrating symmetry and repetition. Then draw the forms or arrangements thus constructed.

Dictation exercise: paper folding and cutting. Model solids and type-forms in clay. White's Revised Book, No. 3.

Fourth Year.—Review work of the previous years. Illustrate by paper folding and cutting. Soap-carving and clay-modelling. From pyramids, triangular prisms, and objects based on them, teach:—

1. Triangles.
2. Squares, oblongs, circles.
3. Construct forms from paper and wood.
4. Draw simple forms and modify.
5. Frequent dictation and memory exercises.

Blank pages used for model and object drawings. White's Revised Book, No. 4.

WORCESTER.

The Worcester Exhibit of Drawing showed the work done by the children from the first year in the primary school to the end of the fourth year in the high school, also work from the three evening drawing classes.

Beginning with the first year, the child is taught to observe the form of objects, taking the simple type-forms for the basis. These forms he reproduces in clay, and then from what he makes develops objects which he has noticed in every-day life. By means of stick-laying and paper-folding the faces and edges of objects are represented, the fingers are taught to be skilful. The third year is the beginning of work with the lead-pencil. Original arrangement of conventional forms is all that is done in the third and fourth years in the way of individual design. The children draw the appearance of objects in the third year, beginning with leaves and vegetables, continuing in the fourth and fifth years; in addition to these, drawings from cylindrical objects, not till the sixth year taking up the appearance of objects in perspective with straight edges. In the fifth year they have acquired enough practice to make simple ornamental units for design, with considerable originality. In the four succeeding years this quality is developed, gradually using plant-forms for the basis of the designs. Drawings of the facts of form are made from the beginning, and continued through the ninth year. Beginning with the third year, each child makes in connection with his drawing one or two objects from paper or card-board for every drawingbook. One or more designs are cut from colored paper also for each drawingbook.

In the high school there are three classes. The class in free-hand drawing works in charcoal from models, casts, and still life groups entirely, making drawings in outline and light and shade.

The class in mechanical drawing works from models, machines, and parts of machinery principally, a little theoretical work being given each year. The class in color, after several sheets of flat tints and washes, to learn something of the mechanical use of the medium as well as knowledge of the harmony of color, begins coloring simple original designs, which is continued through various stages, the object being not to make designers of the pupils, but to give them an idea of harmonious color and suitable and artistic arrangements of form in ornamentation. In connection with this, painting from still-life studies and flowers is pursued.

The free-hand evening drawing classes begin with working in outline from models, continuing in light and shade from the same, drawing from casts, and finally working from a life model, making studies of the head only. All work is done with charcoal. The evening classes for architectural and mechanical drawing work partly from models and theory, and do some work from plates. There are classes for beginners and advanced students in both classes.

SPRINGFIELD.

Drawing was first introduced into the grammar grades of the schools in September, 1870, but was taught by the regular teachers.

A special teacher in drawing was appointed in September, 1874. The Prang books were used in all the grades for several years.

In September, 1890, grades VI., VII., VIII., IX., began working upon drawing-pads, the work being prepared by the Supervisor of Drawing.

The work in all the grades at present is as follows:—

First Year.—Solids: sphere, cylinder, cube, hemisphere. Prisms: square, right-angled. Expression by moulding clay; cutting; drawing at board and on paper; pasting and sewing.

Second Year.—Review first year solids, and study equilateral triangular prism, ellipsoid, ovoid, cone, and square pyramid. Leaves. Expression as in first year.

Third Year.—Review from study. Prang's Shorter Course, Book 1 twice. Additional work on paper. Making in card-board.

Fourth Year.—Prang's Shorter Course, Book 2 twice. Additional work on paper, and making in card-board.

Fifth Year.—Prang's Shorter Course, Book 3 twice, or Books 3 and 4. Making in card-board.

Sixth Year.—Making in card-board. Paper. Natural leaves. Spirals and curves upon which designs can be constructed. Historic ornament from copy. Designs, using leaves or ornament as motives. Appearance of cylinder, cone, cube, square prism, and common objects based on these solids, two faces showing. Fruit and vegetables. Working drawings teaching use of three views.

These views show foreshortened faces, invisible edges, sections, expression of dimensions.

Seventh Year.—Work done on blank paper. Study of natural leaves. Skeleton curves for designs. Designs using conventionalized leaves as motives. Historic ornament from copy. Appearance. Review work of sixth year, and teach cubes, prisms, and plinths at 45°. Group solids; vegetables. Use of compasses. Essential geometric problems. Application of compass-work to designing, working drawings, and making in card-board.

Eighth and Ninth Years.—Work done on blank paper. Study leaves and flowers. Plant analysis in connection with designs. Drawing natural objects preparatory to science work in high school. Historic ornament. Mechanical drawing. Use of T square, triangles, and drawing board. Making in card-board. Review working drawings. Teach use of scale. Working drawings of common objects, pupils taking their own measurements.

HIGH SCHOOL.

Outline of course in free-hand drawing:—

First Year.—Fall Term: Model drawing reviewed. Study models and objects illustrating appearance of circles with their planes horizontal, vertical, and turned away and at an angle to the ground. Teach convergence of retreating lines; horizontal, oblique, and vertical. Use of charcoal, laying on planes, one sheet. Teach terms used in light and shade: shade, high light, reflected light, intermediate tones, cast shadow. Express three kinds of surface by shading large drawings: cube, one sheet; cylinder, one sheet; sphere, one sheet. Home drawing once a week. Outline of objects based upon above solids or memory drawings of solids.

Winter and Spring Term: Shaded groups of geometric solids, two sheets. Blocking from casts, two tones, two sheets. Home drawings continued.

Summer Term: Casts shaded in three tones. Outline plants in pencil. Design using as motive a plant-form previously studied. Talks on historic ornament once a month to entire class.

Second Year.—Fall Term: Shaded group, vase with geometric solids. Cast drawing. Historic ornament. Home drawings once a week, common objects.

Winter and Spring Term: Cast drawing continued, or flat washes in color to illustrate historic ornament. Still life in charcoal. Memory drawing of same group, shaded in pencil. Home drawing once a week.

Summer Term: Cast drawing or groups of still life in charcoal. Memory drawing of still-life group. Outdoor sketching whenever possible. Talks on historic ornament to the entire class once a month through the year.

Third Year.—Fall Term: Casts from antique home drawing.

Winter and Spring Term: Cast drawing continued or still life in sepia. Pen and ink, if desired. Home drawing.

Summer Term: Flowers, fruits, or vegetables in water-colors. Pen and ink. Outdoor sketching.

Fourth Year.—Cast drawings or water-colors, as elected. Pupils may pass through this course as rapidly as their ability permits. All drawings will be marked, and these marks included in general average.

The mechanical drawing exhibit of the Springfield Manual Training School and High School consisted of the different sheets of the first and second years, while the third-year course was not completely represented in that only about two-thirds of the course was obtainable for the exhibit.

Mechanical drawing is optional with high-school pupils, but compulsory for those attending the manual training school.

One study hour is sacrificed daily for this work, excepting Fridays, when free-hand pen-sketching is substituted.

The classes this year consisted of three divisions of twenty-one each, and the course laid out below is the one followed by them under a special teacher.

MANUAL TRAINING SCHOOL AND HIGH SCHOOL.

Mechanical Drawing.

First Year.—Fall Term: Shop drawings, principles of projection, use of drawing pen, free-hand drawing.

Winter and Spring Term: Shop drawings, pen-lining, scale drawing of simple objects, lettering, free-hand drawing.

Summer Term: Shop drawings, scale drawings of details, and the whole of simple machines from figured free-hand sketches, outdoor sketching.

Second Year.—Fall Term: Shop drawings, orthographic projections (solids intersected) pen shaded, lettering, pen and ink sketching.

Winter and Spring Term: Shop drawings and tracing, isometric projections, development of surfaces and flat tinting, pen and ink sketching.

Summer Term: Shop drawings and tracings, architectural drawing and details with tracing, outdoor sketching.

Third Year.—Fall term: Geometric problems, study of shadows, finished in lines or with brush, architectural drawing with historic ornament.

Winter and Spring Term: Commence finished drawings of structure or working machine, with full details.

Summer Term: Complete drawings of winter term.

LAWRENCE.

Outline of Course in Form Study and Drawing, Public Schools, Lawrence, Mass Henry W. Poor, Director of Drawing. Drawing has been taught in Lawrence, by a special teacher, since 1873. Each public school teacher holds a certificate for teaching drawing.

PRIMARY SCHOOLS.

MATERIALS. Objects, clay, colored paper, scissors, sticks, paper, pencils, rulers, erasers, type-solids and tablets.

METHOD. *Observation.*—I. Wholes; II. Parts; III. Relations. Not only in general order of work, but in each lesson.

Expression.—I. Oral; II. Construction, using clay, paper, sticks, etc.; III. Drawing on blackboard and paper.

☞ Require good position of body, paper, and pencil in all exercises in drawing.


YEAR.	MODELS.	GEOMETRIC FIGURES.	DECORATIVE DRAWING.
1	Sphere, Cylinder, and Cube. Half Sphere, Half Cylinder, and Half Cube. Sq. Prism, Triangular Prism.	Vertical, Horizontal, and Oblique Right, Acute, and Obtuse Angles. Square, Circle, Oblong, and Triangle.	Repetition and Alternation. Using Sticks and Paper. Color.
2	Ellipsoid, Ovoid, Eq. Tri Prism, Cone, Sq Pyramid, Vase Form.	Ellipse, Oval, Eq. Triangle, Triangle. Geometric views of the models studied.	Tablet Laying. Original units about a centre and in borders. Color.
3	Objects of Spherical and Cubical Character. Particular attention is paid to rapid drawing of long, bold lines and circles.	Circle, Circumference, Diameter, Radius. Geometric views of Solids. First two years reviewed.	Repetition, Alternation, Symmetry, Color. } in borders.

GRAMMAR SCHOOLS.

MATERIALS. Objects, manila paper, pencils, rulers, compasses, erasers, knives, scissors, six-inch wires.

METHOD. *Observation.*—I. Wholes; II. Parts; III. Relations. Not only in general order of work, but in each lesson.

Expression.—I. Oral and written speech; II. Drawing on blackboard and paper; III. Construction, using paper, wood, etc.

 Require good position of body, paper, and pencil in all exercises.

THE GRAMMAR WORK MAY BE CONSIDERED UNDER THREE HEADS:

A. GEOMETRIC DRAWING, representing facts of form; accurate, with rule and compass (also called constructive or working drawing).

B. DECORATIVE DRAWING, representing enrichment of form or ornamental forms, either mechanical or free-hand (also called design).

C. PICTORIAL DRAWING, representing appearance of form as seen from one point of view; free-hand (also called model and object drawing).

YEAR.	TYPES.	GEOMETRIC DRAWING.	PICTORIAL DRAWING.	DECORATIVE DRAWING.
4	Sphere and similar forms Fruit and Leaves.	Construct Front and Top Views of Objects. Construct paper box, etc.	Effects of Distance representing Solidity.	1. Decorative Arrangements of Regular Geometric Figures applied in (a) Borders, (b) Surface Patterns.
5	Half Sphere. Vegetables.	Working Drawings of Constructed Objects, such as Triangular Prism, etc.	Use of Pencil in Proportional Measurement. Foreshortening.	2. Modifications of Units of Bi-symmetrical Figures applied in Borders and Centres.
6	Sphere, Cylinder, Cone, Sq. Pyramid, and similar Objects.	Working Drawings and Patterns of Cone, Pyramid, and similar Objects.	Convergence. Use Wires and String.	1. Conventionalization of Entire Parallel-veined Leaves in Borders and Centres.
7	Vase Forms, Models, and Objects.	Working Drawings, Patterns of Models and Objects.	Convergence. Relation of Diagonals.	2. Conventionalization (continued) of Pennate and Palmate Leaves in Borders, Centres, and Surfaces.
8	Plant Forms and Common Objects.	Geometric Problems and application to Constructed Objects.	Relation of Axes.	3. Conventionalization (continued) of Palmate and Compound Leaves in Panels and Surfaces.
9	Groups of Models Books, etc.	Geometric Problems. Details of Machine and Architecture.	Relation of Long and Short Diameters.	4. Conventionalization (continued) of Plant Forms in Elementary Designs.

NOTES.

(a.) Lead pupils to form the habit of making free-hand sketches of objects, of collecting pressed leaves, and tracings of ornamental units and designs.

(b.) Encourage the *construction* of objects from the geometric or working drawings, and of ornamental articles from the designs. At least have two designs constructed each term.

HIGH SCHOOLS.

YEAR.	TYPES.	GEOMETRIC DRAWING.	PICTORIAL DRAWING.	DECORATIVE DRAWING.
10	Models, Natural Flowers.	Geometry. Orthographic Projection.	Light and Shade, Crayon Sauce.	Harmony of Color: Historic Ornament. Elementary Design.
11	Models, Casts, and Flowers.	Machine Drawing. Architectural Drawing.	Pencil Outlines, Light and Shade, and Crayon Sauce.	Elementary Design. Applied Design. Color.
12	Models, Casts, and Flowers.	Machine Drawing. Architectural Drawing.	Pencil Drawing, Light and Shade in Crayon and Charcoal Point.	Applied Design. Color.
13	Natural Objects, Flowers, Models, and Casts in Light and Shade and Water Colors.	Machine and Architectural Original Work.	Light and Shade in Charcoal Point and Crayon Sauce.	Still Life in Water Colors from Objects.

THE BOSTON PUBLIC KINDERGARTENS AND THEIR EXHIBIT.

The Committee in charge of the Manual Training Conference have asked for a brief account of the origin and development of the Boston public kindergartens, in addition to a description of the work on exhibition. In 1870 the Boston School Board, at the earnest request of Miss Elizabeth Peabody and friends of the system, established a kindergarten in the Somerset Primary School-house, which was carried on for several years. About this time Mrs. Quincy A. Shaw became interested in the kindergarten, and in July, 1877, opened two kindergartens,—one in Jamaica Plain and another in Brookline. Others were soon added to these, until in 1883 Mrs. Shaw had established thirty-one kindergartens,—twenty-three in Boston, five in Cambridge, two in Brookline, and one in Chelsea, with about seventeen hundred children from three and one-half to five and one-half years of age. Owing to the removal of several kindergartens from school-rooms needed for the regular school classes, this number was reduced; but the work was carried on with the same ardor and with increasing confidence.

Like everything new, it had many difficulties to overcome. Ignorant friends sometimes blocked its progress, and the indifference of the general public was a heavy and steady drag. The people with whom its advocates were most concerned were the parents who should send their children to kindergartens and the teachers who were to receive the children in the primary schools. By the persistent personal effort of the kindergarten teachers, visiting in the families in the neighborhoods, the attendance of the children was gained, and by having the kindergartens placed as far as practicable in the public school buildings teachers both hostile and friendly had an ever present opportunity for observing the work. Through the parents the general public was gradually reached, and through the teachers and friends of the system the educational public. One strong feature of Mrs. Shaw's management, perhaps the one which raised the educational

value of the Boston kindergartens, was the extreme care exercised in the selection of teachers. Wherever the kindergarten is to win its way, too much emphasis cannot be placed upon the necessity of such care. The good kindergartner must have not only those qualities of heart and mind which constitute a natural fitness for such important work, but these must be brought out and supplemented by thorough training in the principles and methods of Froebel. But this care was not all that was deemed necessary to secure the best results. Year after year supplementary instruction has been given to the teachers in the philosophy of Froebel, in psychology, in games, in music, drawing, clay modelling, etc.; and there have been frequent lectures on topics of interest and value to the work.

In 1883 two kindergarten teachers from St. Louis, of marked ability in special lines of work, were engaged to come to Boston for a year, to give advanced courses in the principles and practice of the kindergarten. These lessons were enthusiastically received, and the introduction of some of the methods taught at that time has proved to be of great value to the work.

The teachers' weekly meetings added another element of strength to the kindergarten. To them the supervisors brought helpful suggestion and criticisms, and arranged programmes of work adapted to all the kindergartens, and gave instruction in special branches. At these meetings the teachers exchanged experiences and gave anything new they had gained in points of method in song, game, or story, for the benefit of all. A small library of educational literature and a cabinet of natural history specimens were also provided by Mrs. Shaw for the use of the kindergartners.

In 1887 a committee of the Boston School Board was appointed, to consider the desirability of adopting the kindergartens in Boston, and in a report of the investigation and recommendation of the committee occurs the following: "Under Mrs. Shaw's management and munificent expenditure, the kindergarten has been so conducted and improved as to assume a new relation to our school system, and now appears as fully entitled to incorporation into that system as any existing grade of schools." Acting on this recommendation, the School Board adopted in 1888 the fourteen kindergartens established by Mrs. Shaw and one that had been carried on for several years by Mrs. James Tolman. In 1889 the School Board established ten new ones, and in 1890 six others were added, making a total of thirty-one, with an attendance of nearly two thousand children.

No radical changes have been made, but everything has been done to re-enforce and strengthen the work, and the high standard that characterized these kindergartens while under Mrs. Shaw's care has been carefully maintained. The measure of success attained by the Boston kindergartens has been due to the effort made to realize a high degree of excellence in all parts of the work, to careful organization, and to the enthusiastic devotion of all the workers engaged in them.

In 1888 Brookline adopted the kindergartens that had been carried on by Mrs. Shaw, and has since added two others; and in 1889 Cambridge adopted the remaining three founded by Mrs. Shaw, and has since established three others.

THE EXHIBIT.

This department contained manual work from all the Boston and Cambridge kindergartens. There were specimens of weaving, sewing, paper-folding, paper-cutting, drawing, modelling, outlining of geometric solids with sticks and peas, designs in rings, etc.

The difficulty of describing the multitudinous variety of work is obviously too great to be attempted; but some points may be noted with regard to the exhibit as a whole. It consisted of work from all the kindergartens, both first and second year grade, and was truly representative in that it included the best and poorest and all grades between. Progressive series of

sewing, weaving, clay modelling, etc., were shown. The sequences were sometimes individual and sometimes class work. There was also an interesting collection of inventions by the children in all lines of kindergarten work. No one who looked at these could fail to see how opportunities for expression are continually ready to the child in kindergarten, encouraging him to give out his impressions and thoughts and thus testing and realizing them.

Probably the most appreciated part of this inventive division of the exhibit was to be found in the illustrative drawing, unquestionably free-hand,—delightful triumphs of effort and imagination. Here were pictured bits of stories and lessons, the songs and games, often with great spirit and with telling lines, which were surprising when one considered how tiny were the fingers that wielded the pencil or crayon. The kindergarten is bright with red-letter days, and the festival-keeping spirit was manifested in several charts upon which were mounted objects made of kindergarten material for special exercises on Froebel's birthday, Washington's birthday, Thanksgiving, Valentine's Day, etc. An attractive showing of useful and fancy articles made from weaving mats, etc., afforded a hint of the kindergarten Christmas. A great effort was made to have all the articles marked distinctly and definitely; but, of course, the more the observer knew about kindergarten, the more intelligible the work was, and the greater the appreciation of its educational value. That the kindergarten gives admirable training in neatness was shown by the exquisite cleanliness of the work, much of it being done with delicate colored papers and white cards and by very young workers,—often foreigners, in many of whose homes neatness is a thing almost unknown. To the superficial observer the kindergarten exhibit must have seemed a thing apart, and without connection with the more advanced work displayed; but the student of manual training knows it is the foundation of the whole structure.

THE EXHIBIT OF THE FREE EVENING DRAWING SCHOOLS OF BOSTON.

This exhibition contained between three and four hundred examples of industrial drawing and about twenty casts from work done in the modelling classes.

The work from the modelling classes illustrated the three years' course of instruction in modelling, and displayed: (1) modelling of ornament from the flat and (2) from the round; (3) modelling in low relief from objects; (4) modelling the human figure (or details thereof) from the flat and from the round; (5) translations from the round into low relief; and (6) original designs for stone carving.

The work from the drawing classes illustrated the four years' course of instruction in free-hand, decorative, machine, architectural, and ship drawing. In the free-hand division were: (1) geometric drawing; (2) drawing of historic ornament as an introduction to design; (3) geometric designs; (4) plant drawings and structural analysis; (5) elementary designs based upon the laws of growth in plants; (6) model and object drawing in outline; (7) model and object drawing in light and shade; (8) drawings from casts of historic ornament and (9) from casts of the human figure (or from details thereof) in light and shade; (10) original applied designs.

Illustrating the *general* course of instruction in all the divisions of mechanical drawing were shown: (1) plane and (2) solid geometry (elementary and advanced); (3) isometric drawing; (4) orthographic projection; (5) conic sections; (6) intersection of solids; and (7) development of surfaces.

In the architectural division were shown: (1) building construction (framing and roofing); (2) plans of buildings; (3) elevations; (4) sections; and (5) original designs for buildings of various kinds. In the ship-draughting division were original designs for various kinds of (1) boats, (2) yachts, and (3) sailing vessels.

In the division devoted to machine drawing were found drawings of (1) screws, (2) belting, (3) gearing, (4) machine details, (5) complete machines, (6) engines, and (7) original designs for various kinds of machinery.

The purpose of this exhibition was not to make a full and complete showing of all the work done in these schools, but to illustrate their course of instruction as fully as possible with the amount of surface which had been assigned to them.

That this purpose was successfully carried out we think all who saw the display will readily admit. All the work was admirably arranged, so that whoever was inclined so to do could easily read the progress of the course of instruction in each of its separate divisions from the first illustration of the first year's course, through each step of its advancement, to its final development at the end of the fourth year.

While it would be entirely aside from the purpose of this notice to speak of individual works in this collection, it seems perfectly proper to state that each division in the different departments of drawing and modelling was admirably illustrated by work which showed on the part of the pupils a great deal of character and individuality, such as must have been developed by a good course of instruction presented by a competent corps of instructors.

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